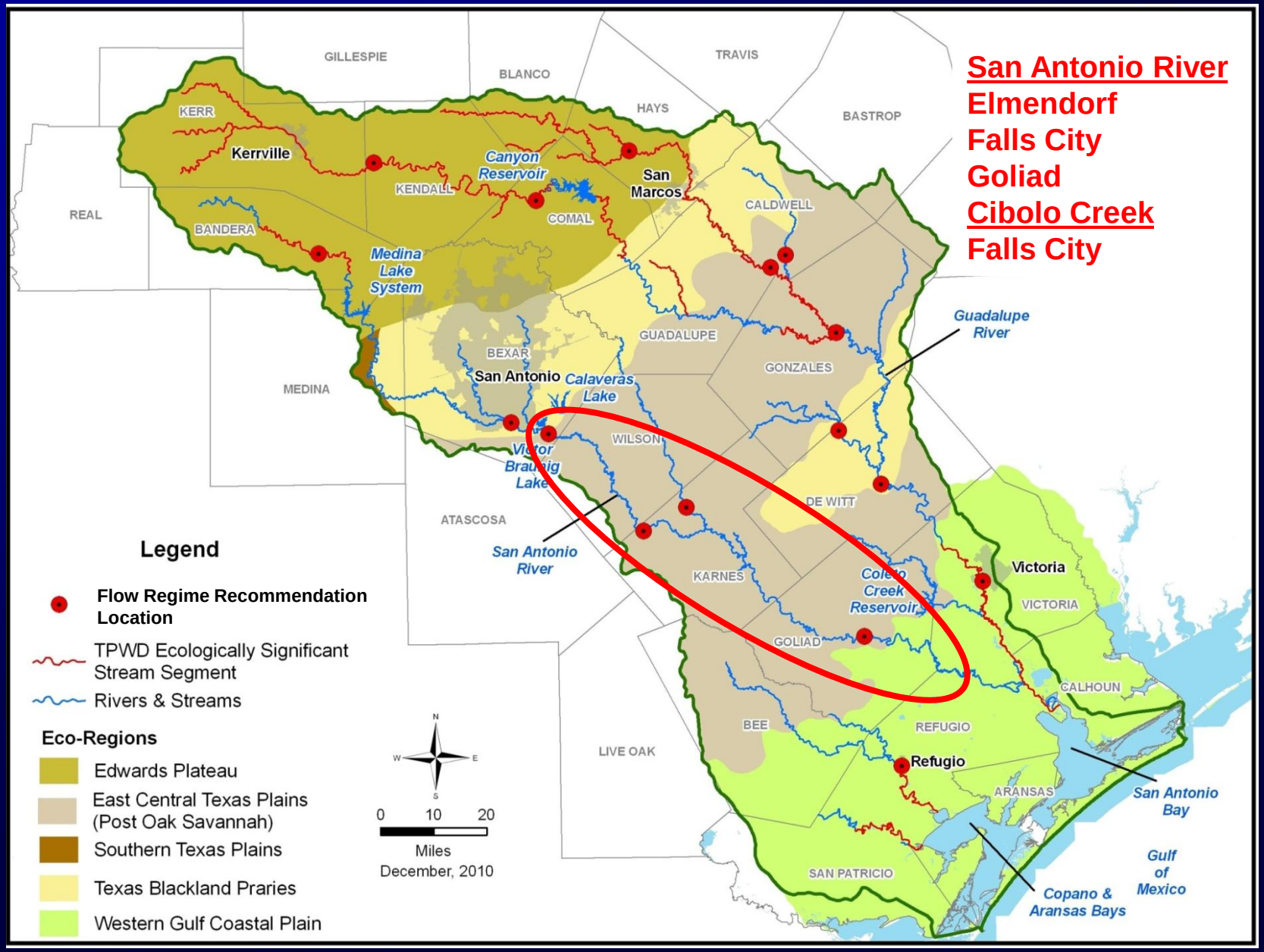
*Guadalupe, San Antonio, Mission, & Aransas Rivers and Mission, Copano, Aransas, & San Antonio Bays Basin and Bay Area Stakeholder Committee (GSA BBASC)*

# GSA BBASC Recommendations: Summary Information for All 16 Sites

**R Brian Perkins, PE**

**July 6, 2011**

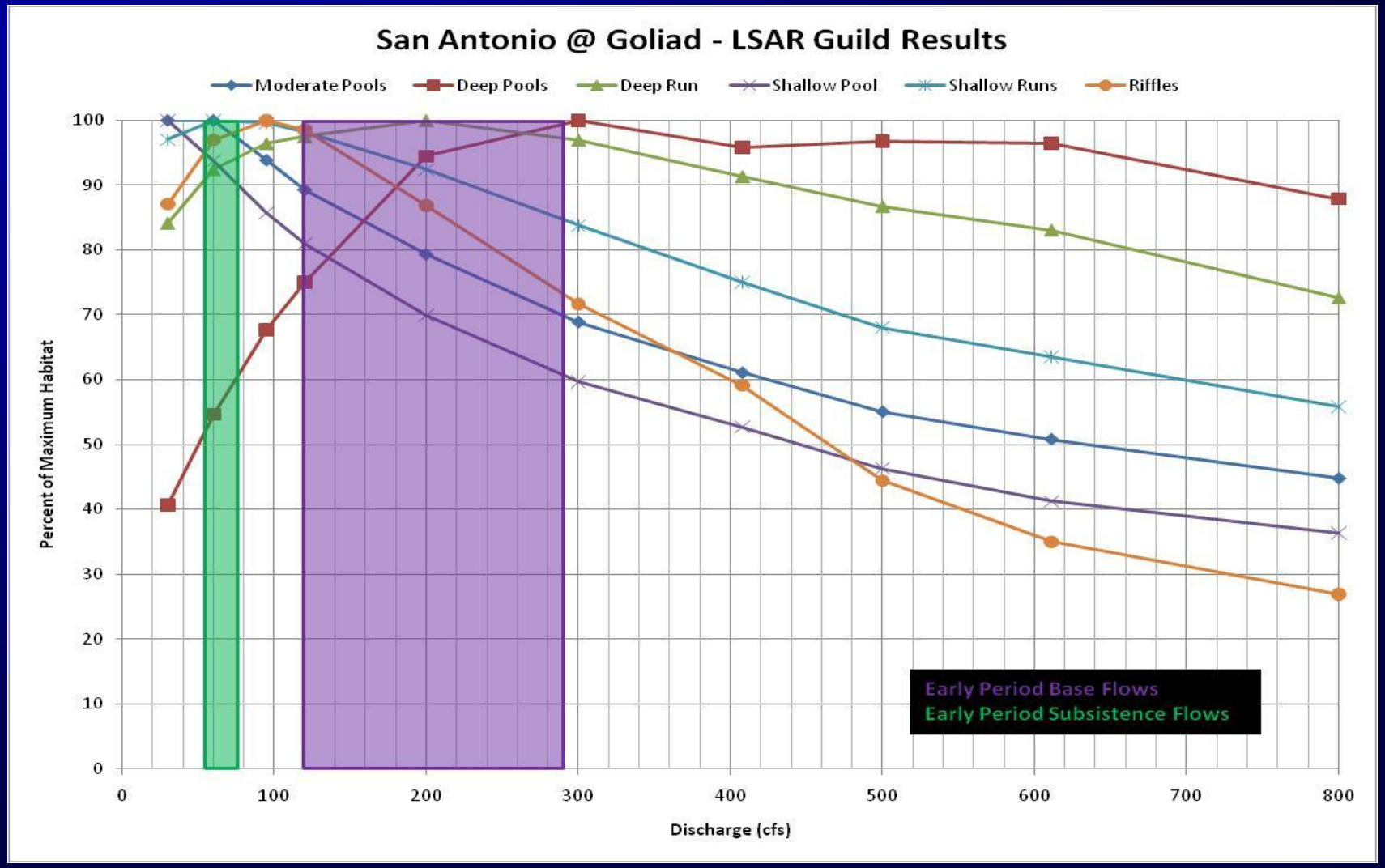
# Group 1:
# San Antonio River Basin Locations w/ Site-Specific Habitat Information



# San Antonio River at Goliad (BBEST)

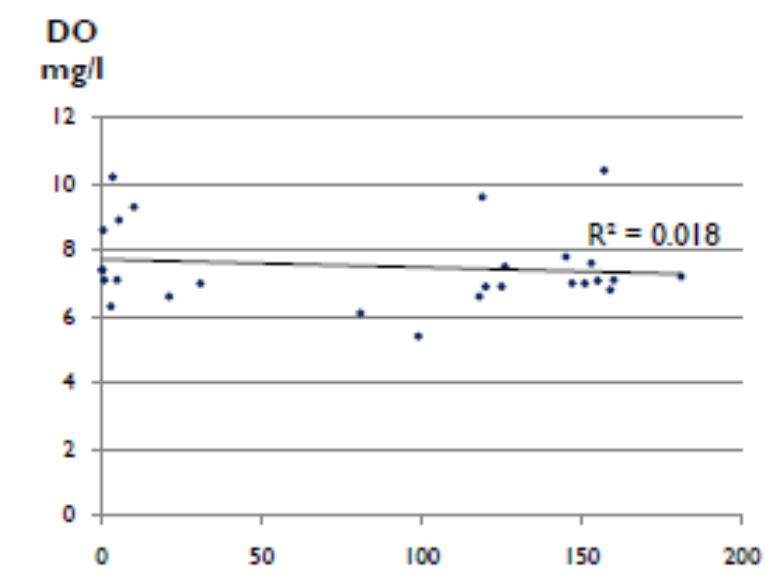
| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overbank Flows** | Qp: 23,600 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 273,000<br>Duration Bound is 69 | | | | | | | | | | | |
| | Qp: 10,600 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 107,000<br>Duration Bound is 45 | | | | | | | | | | | |
| | Qp: 7,680 cfs with Average Frequency 1 per year<br>Regressed Volume is 73,500<br>Duration Bound is 38 | | | | | | | | | | | |
| **High Flow Pulses** | Qp: 1,520 cfs with Average Frequency 1 per season<br>Regressed Volume is 12,800<br>Duration Bound is 19 | | | Qp: 3,540 cfs with Average Frequency 1 per season<br>Regressed Volume is 30,000<br>Duration Bound is 24 | | | Qp: 1,640 cfs with Average Frequency 1 per season<br>Regressed Volume is 11,200<br>Duration Bound is 16 | | | Qp: 2,320 cfs with Average Frequency 1 per season<br>Regressed Volume is 17,600<br>Duration Bound is 19 | | |
| | Qp: 550 cfs with Average Frequency 2 per season<br>Regressed Volume is 3,940<br>Duration Bound is 11 | | | Qp: 1,570 cfs with Average Frequency 2 per season<br>Regressed Volume is 11,300<br>Duration Bound is 16 | | | Qp: 750 cfs with Average Frequency 2 per season<br>Regressed Volume is 4,450<br>Duration Bound is 10 | | | Qp: 780 cfs with Average Frequency 2 per season<br>Regressed Volume is 5,070<br>Duration Bound is 11 | | |
| **Base Flows (cfs)** | 290 | | | 280 | | | 220 | | | 270 | | |
| | 200 | | | 180 | | | 150 | | | 200 | | |
| | 140 | | | 130 | | | 120 | | | 130 | | |
| **Subsistence Flows (cfs)** | 76 | | | 60 | | | 54 | | | 66 | | |
| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| | **Winter** | | | **Spring** | | | **Summer** | | | **Fall** | | |

# San Antonio River at Goliad (BBEST)




- High percentages of maximum habitat maintained at BBEST subsistence and base flows.

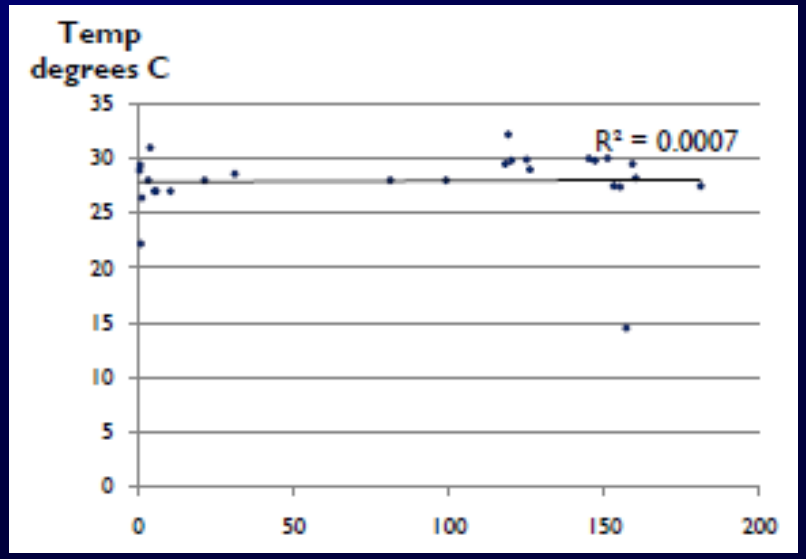
# San Antonio River at Goliad (BBEST)




• No violations of 5 mg/l TCEQ stream standard for dissolved oxygen measured at lowest flows (cfs).

• TPWD has Moderate concern with BBEST subsistence flows (1 Habitat Guild < 80% max, LSAR WQ Model = 80 cfs).

• No violations of 90 degF TCEQ stream standard for temperature measured at lowest flows (cfs).



# San Antonio River at Goliad (TIFP)

**GOLIAD**

**Overbank Flow**

Magnitude = 14,000 cfs
Frequency = 1 event
Duration = 2 days

*Key Indicators:*
*Riparian: Inundates approx. 90% of hardwood forest community*
*Sediment transport: Channel maintenance*

Magnitude = 11,500 cfs
Frequency = 1 event
Duration = 2 days

*Key Indicators:*
*Riparian: Inundates approx. 65% of hardwood forest community*
*Sediment transport: Channel maintenance*

**High Flow Pulses**

Magnitude = 8,000 cfs
Frequency = 2 events
Duration = 2-3 days

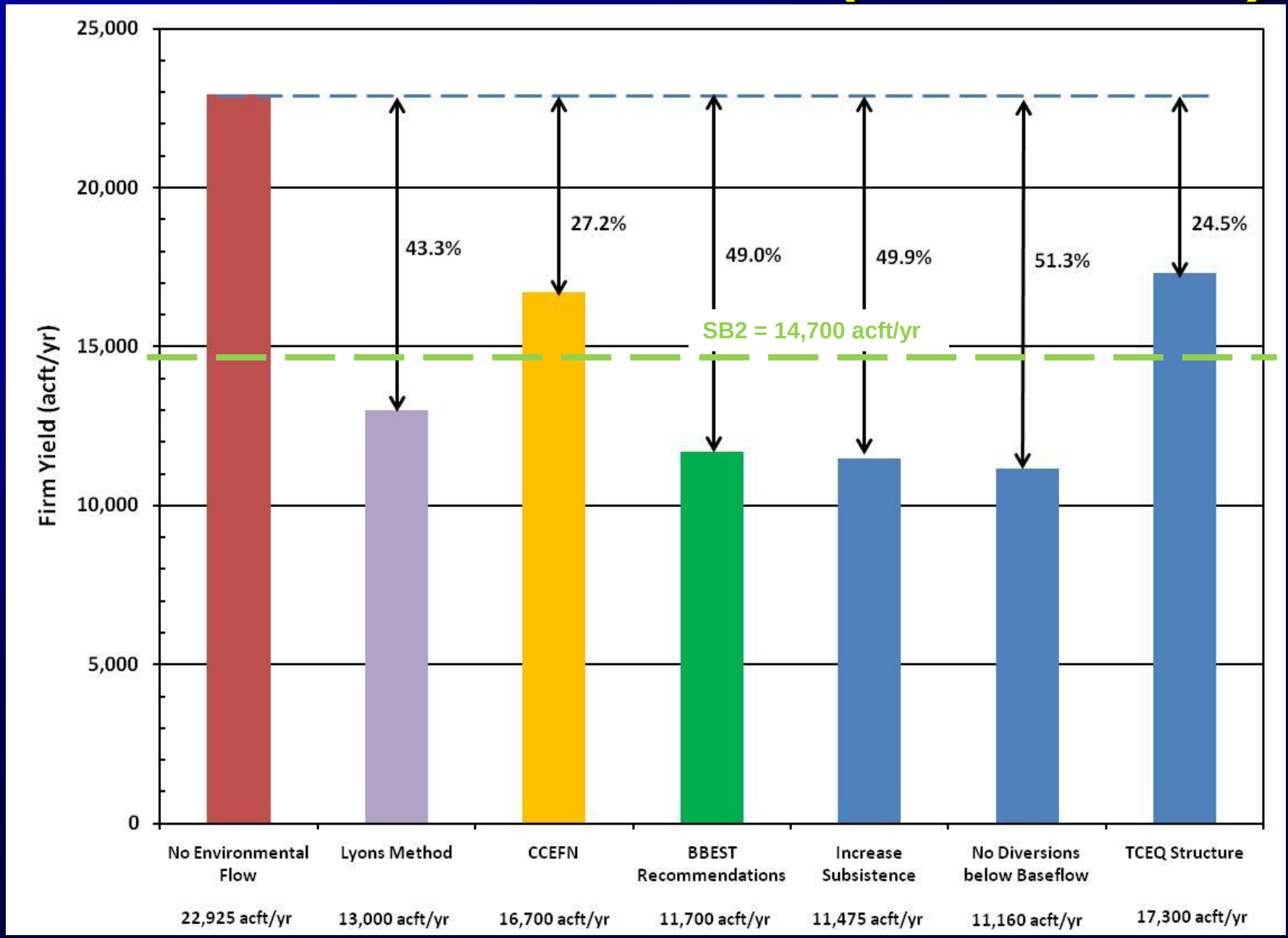
*Key Indicators:*
*Riparian: Green Ash / Box Elder*

*Key Indicators: Riparian - Sycamore*
Magnitude = 4,000 cfs
Frequency = 2 events
Duration = 2-5 days

Magnitude = 4,000 cfs
Frequency = 3 events
Duration = 2-5 days
*Key Indicators: Riparian - Black Willow*

| BASE FLOWS (cfs) - Aquatic Habitat protection (intra- and interannual variability) | | | | | | | | Key Indicators: Aquatic Habitat, Water Quality | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Base Wet** | 475 | 460 | 471 | 470 | 538 | 498 | 503 | 434 | 507 | 531 | 579 | 535 |
| **Base Average** | 325 | 340 | 323 | 305 | 326 | 308 | 248 | 212 | 252 | 272 | 287 | 282 |
| **Base Dry** | 200 | 203 | 197 | 178 | 190 | 154 | 121 | 111 | 186 | 155 | 169 | 176 |
| **SUBSISTENCE FLOWS (cfs) - Water quality protection and maintainence of limited aquatic habitat** | | | | | | | | **Key Indicators: Water Quality, Aquatic Habitat** | | | | |
| **Subsistence** | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| **MONTH** | January | February | March | April | May | June | July | August | September | October | November | December |

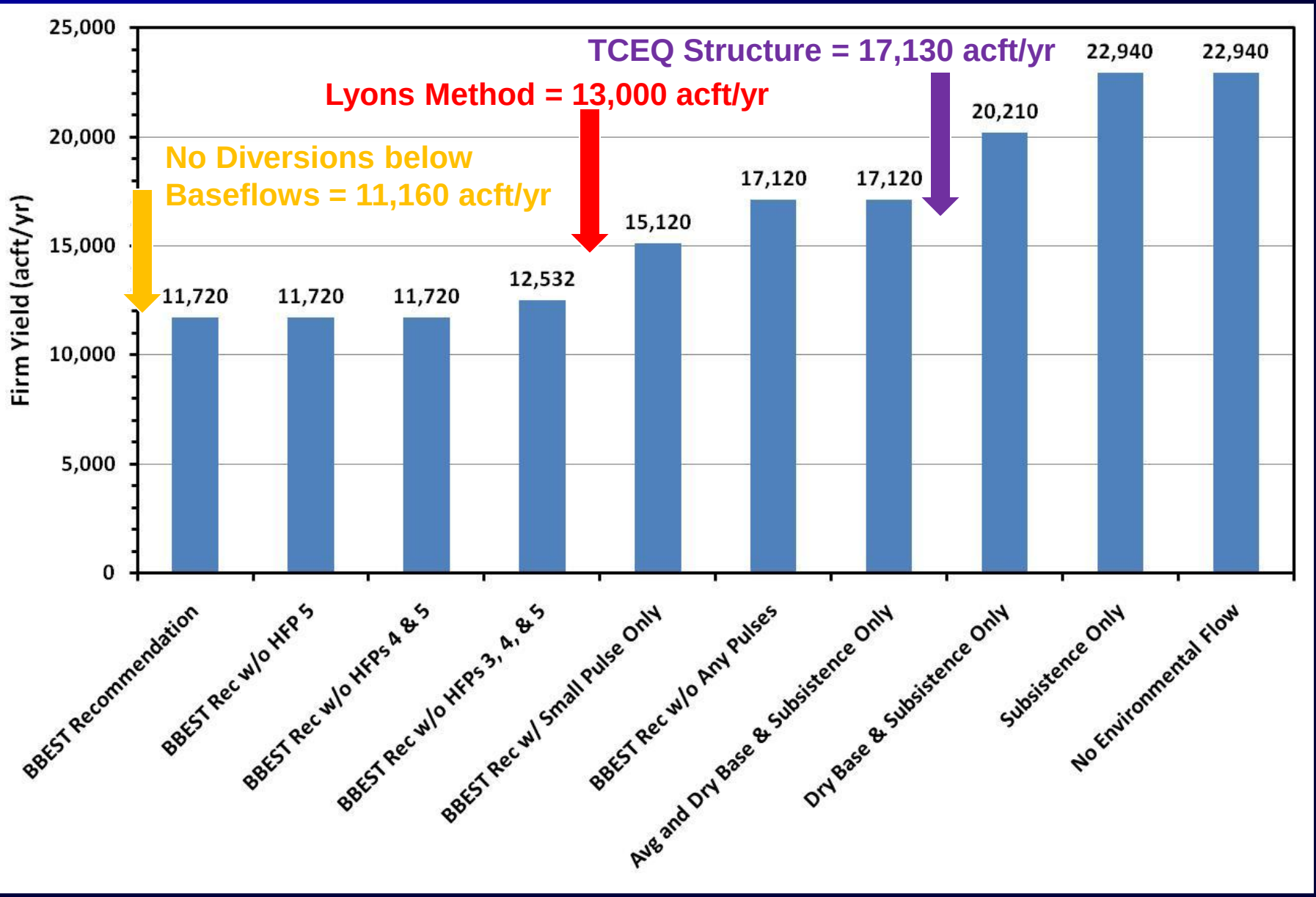
# San Antonio River at Goliad (BBASC Work)



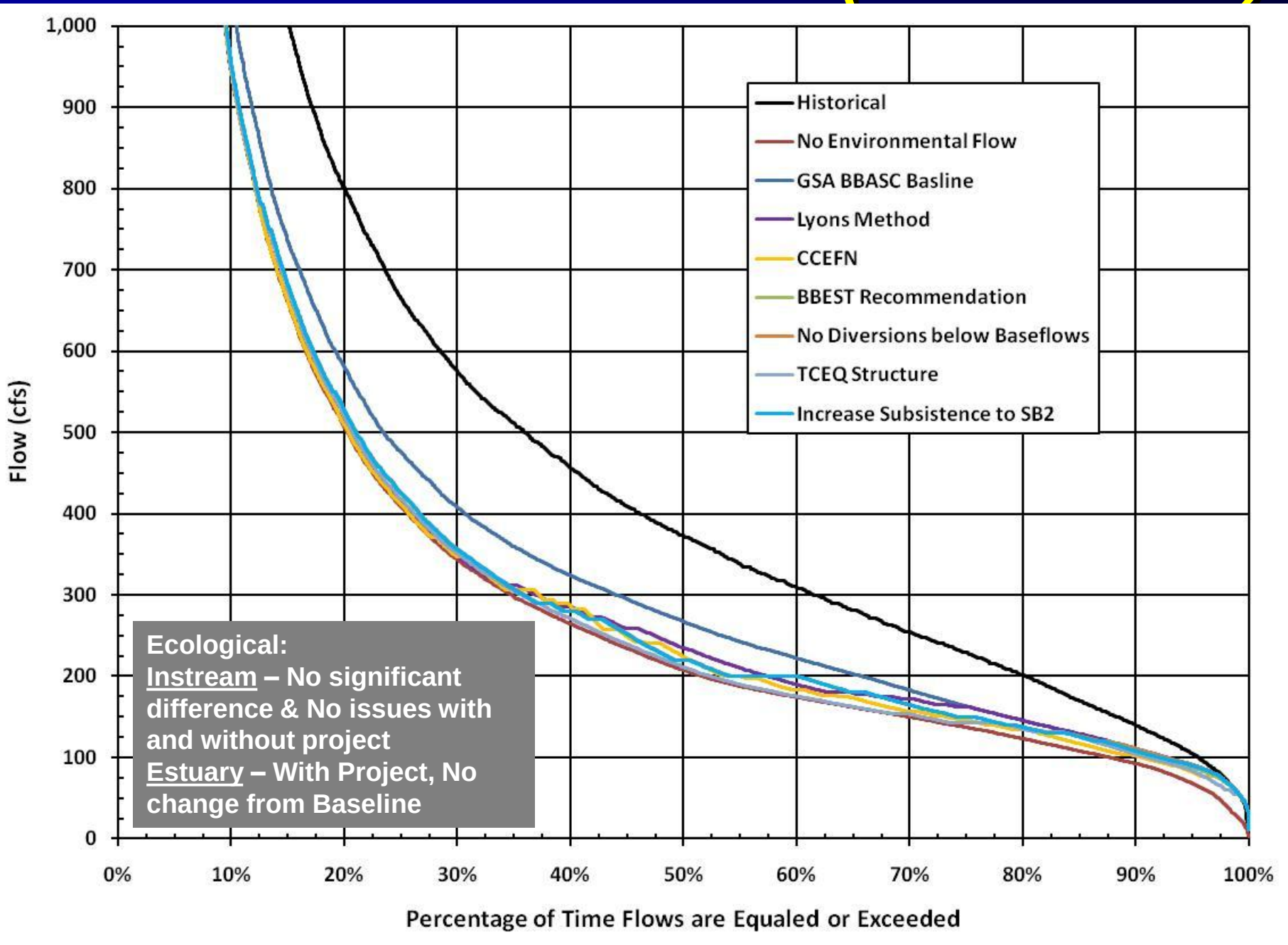
# San Antonio River at Goliad (BBASC Work)

| | No Environmental Flow | Lyons Method | CCEFN | BBEST Recommendation | BBEST - No Diversions below Baseflow | TCEQ Structure |
|---|---|---|---|---|---|---|
| Available Project Yield (acft/yr) | 22,925 | 13,000 | 16,700 | 11,700 | 11,160 | 17,300 |
| | | | | | | |
| **Raw Water at Reservoir** | | | | | | |
| Total Project Cost | $273,450,000 | $273,450,000 | $273,450,000 | $273,450,000 | $273,450,000 | $273,450,000 |
| Total Annual Cost | $24,560,000 | $24,378,000 | $24,396,000 | $24,232,000 | $24,232,000 | $24,396,000 |
| Annual Cost of Raw Water ($ per acft) | $1,071 | $1,875 | $1,461 | $2,071 | $2,171 | $1,410 |
| Annual Cost of Raw Water ($ per 1,000 gallons) | $3.29 | $5.75 | $4.48 | $6.36 | $6.66 | $4.33 |
| | | | | | | |
| **Treated Water Delivered** | | | | | | |
| Total Project Cost | $523,535,000 | $440,614,000 | $471,271,000 | $432,205,000 | $428,764,000 | $475,015,000 |
| Total Annual Cost | $54,793,000 | $44,634,000 | $48,586,000 | $43,006,000 | $42,420,000 | $49,272,000 |
| Annual Cost of Water ($ per acft) | $2,390 | $3,433 | $2,909 | $3,676 | $3,801 | $2,848 |
| Annual Cost of Water ($ per 1,000 gallons) | $7.33 | $10.54 | $8.93 | $11.28 | $11.66 | $8.74 |

# San Antonio River at Goliad (BBASC Work)



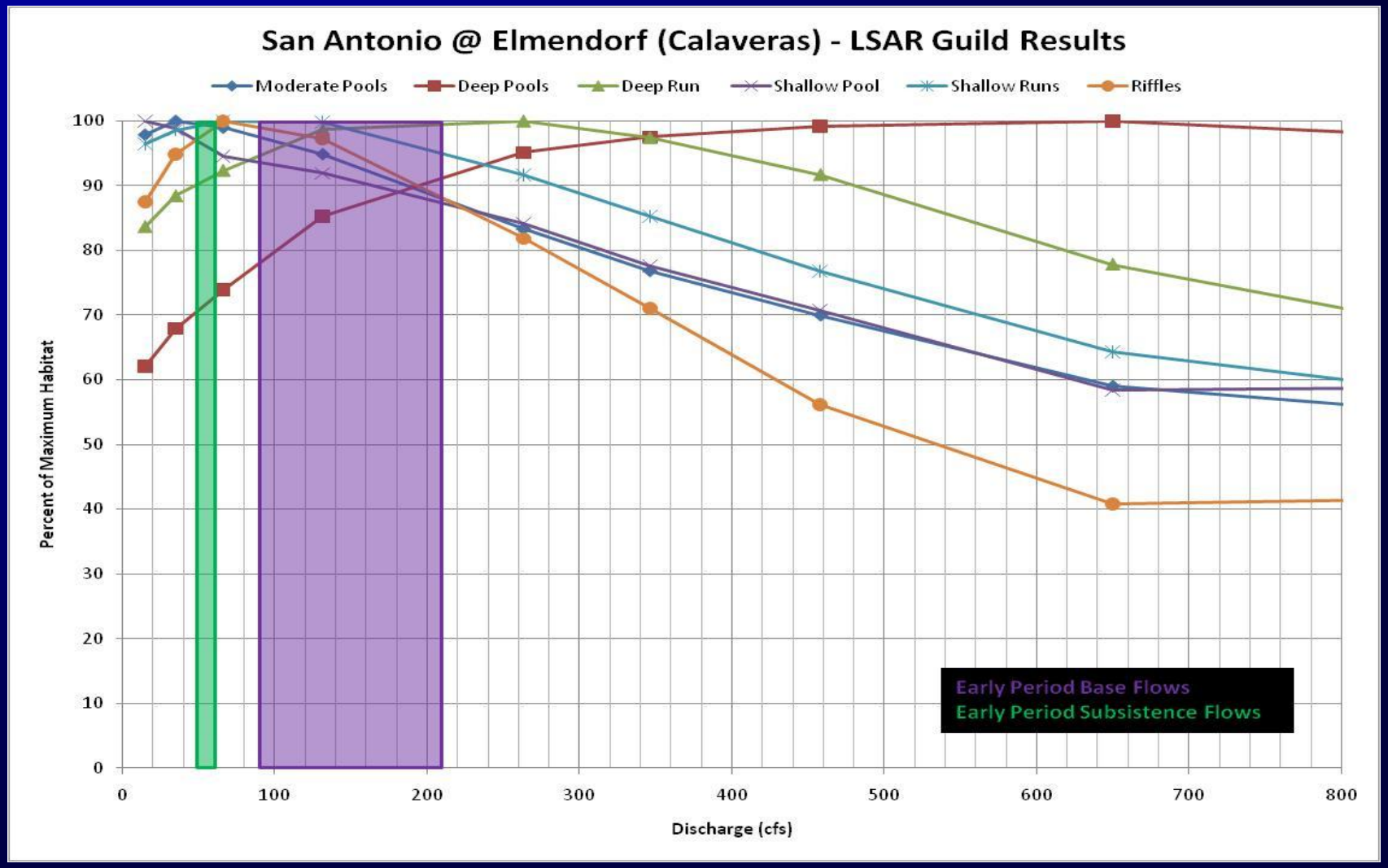
# San Antonio River at Goliad (BBASC Work)



# San Antonio River near Elmendorf (BBEST)

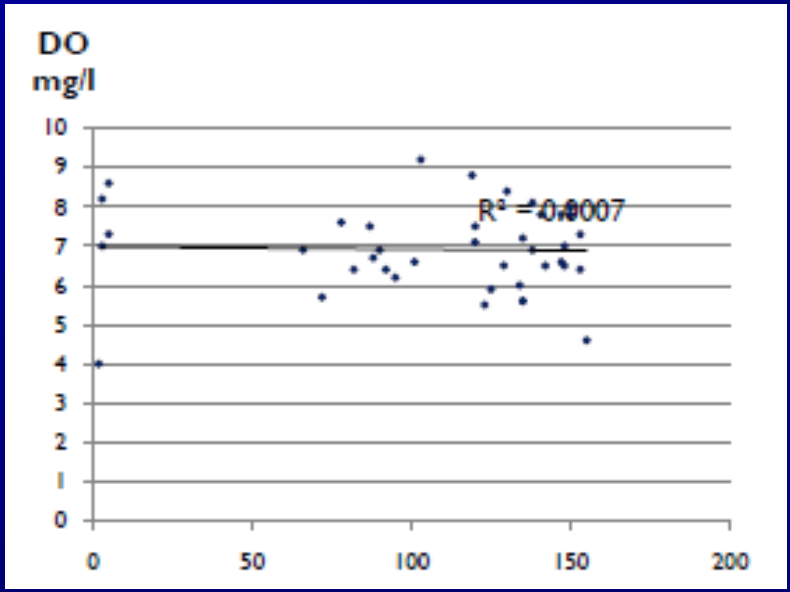
| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overbank Flows** | Qp: 12,200 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 123,000<br>Duration Bound is 52 | | | | | | | | | | | |
| **High Flow Pulses** | Qp: 5,640 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 49,400<br>Duration Bound is 34 | | | | | | | | | | | |
| | Qp: 3,310 cfs with Average Frequency 1 per year<br>Regressed Volume is 26,400<br>Duration Bound is 25 | | | | | | | | | | | |
| | Qp: 830 cfs with Average Frequency 1 per season<br>Regressed Volume is 6,210<br>Duration Bound is 14 | | | Qp: 1,560 cfs with Average Frequency 1 per season<br>Regressed Volume is 10,700<br>Duration Bound is 16 | | | Qp: 1,110 cfs with Average Frequency 1 per season<br>Regressed Volume is 6,460<br>Duration Bound is 12 | | | Qp: 1,010 cfs with Average Frequency 1 per season<br>Regressed Volume is 6,570<br>Duration Bound is 13 | | |
| | Qp: 440 cfs with Average Frequency 2 per season<br>Regressed Volume is 2,940<br>Duration Bound is 10 | | | Qp: 820 cfs with Average Frequency 2 per season<br>Regressed Volume is 5,060<br>Duration Bound is 11 | | | Qp: 540 cfs with Average Frequency 2 per season<br>Regressed Volume is 2,870<br>Duration Bound is 9 | | | Qp: 480 cfs with Average Frequency 2 per season<br>Regressed Volume is 2,630<br>Duration Bound is 8 | | |
| **Base Flows (cfs)** | 210 | | | 200 | | | 170 | | | 190 | | |
| | 150 | | | 150 | | | 130 | | | 150 | | |
| | 110 | | | 99 | | | 88 | | | 97 | | |
| **Subsistence Flows (cfs)** | 61 | | | 50 | | | 49 | | | 56 | | |
| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| | **Winter** | | | **Spring** | | | **Summer** | | | **Fall** | | |

# San Antonio River near Elmendorf (BBEST)




- High percentages of maximum habitat maintained at BBEST subsistence and base flows.

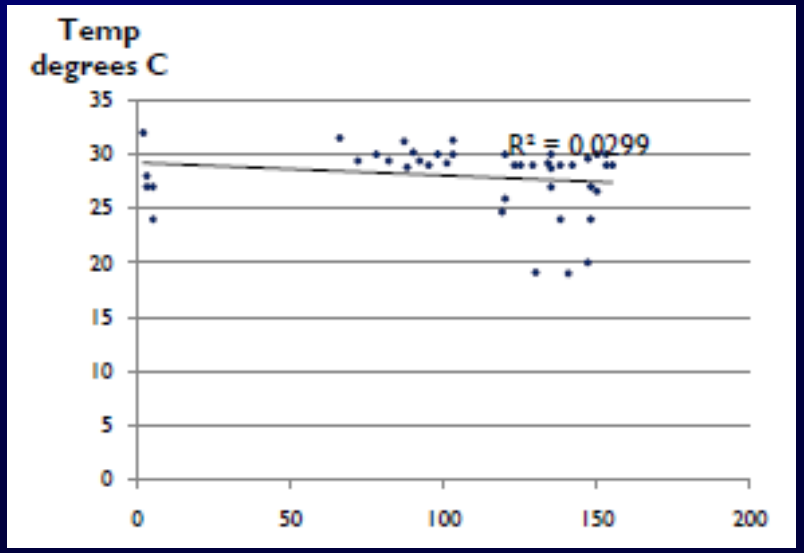
# San Antonio River near Elmendorf (BBEST)




- Two violations of 5 mg/l TCEQ stream standard for dissolved oxygen measured at lowest flows (cfs).

- TPWD has Moderate concern with BBEST subsistence flows (1 Habitat Guild < 80% max, LSAR WQ Model = 80 cfs).

- No violations of 90 degF TCEQ stream standard for temperature measured at lowest flows (cfs).



# San Antonio River near Elmendorf (TIFP)

**ELMENDORF**

**Overbank Flow**

Magnitude = 11,500 cfs
Frequency = 1 event
Duration = 2 days

*Key Indicators:*
*Riparian: Inundates approx. 90% of hardwood forest community*
*Sediment transport: Channel maintenance*

Magnitude = 8,000 cfs
Frequency = 1 event
Duration = 2 days

*Key Indicators:*
*Riparian: Inundates approx. 75% of hardwood forest community*
*Sediment transport: Channel maintenance*

**High Flow Pulses**

Magnitude = 4,000 cfs
Frequency = 2 events
Duration = 2-3 days
*Key Indicators: Cottonwood*

Magnitude = 4,000 cfs
Frequency = 2 events
Duration = 2-3 days
*Key Indicators:*
*Riparian: Green Ash / Box Elder*

Magnitude = 3,000 cfs
Frequency = 3 events
Duration = 2-5 days
*Key Indicators: Riparian - Black Willow*

**BASE FLOWS (cfs) - Aquatic Habitat protection (intra- and interannual variability)** **Key Indicators: Aquatic Habitat, Water Quality**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Base Wet** | 319 | 336 | 329 | 338 | 372 | 382 | 384 | 303 | 336 | 357 | 390 | 355 |
| **Base Average** | 264 | 268 | 256 | 235 | 259 | 216 | 177 | 160 | 195 | 220 | 226 | 225 |
| **Base Dry** | 119 | 113 | 114 | 109 | 113 | 98 | 90 | 90 | 107 | 90 | 91 | 101 |

**SUBSISTENCE FLOWS (cfs) - Water quality protection and maintainence of limited aquatic habitat** **Key Indicators: Water Quality, Aquatic Habitat**

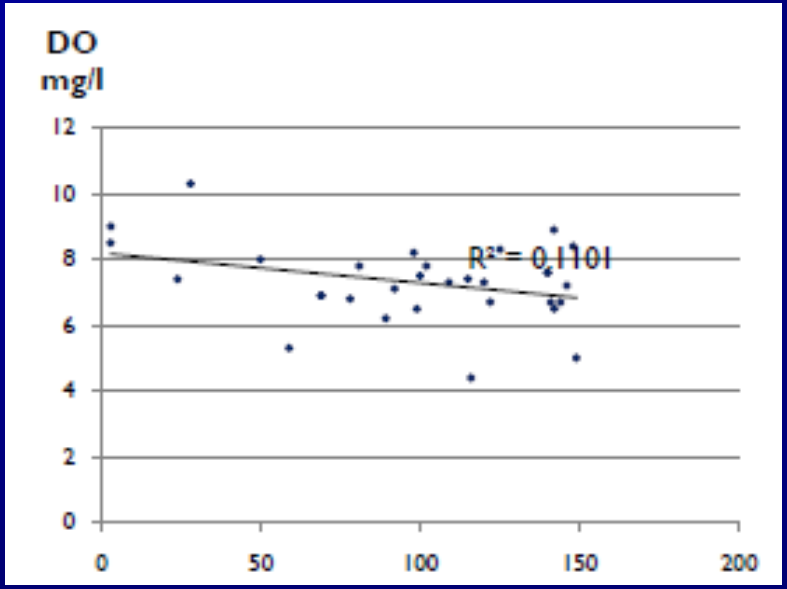
| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Subsistence** | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |

| **MONTH** | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

# San Antonio River near Falls City (BBEST)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overbank Flows** | Qp: 10,600 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 110,000<br>Duration Bound is 57 | | | | | | | | | | | |
| | Qp: 6,000 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 56,500<br>Duration Bound is 41 | | | | | | | | | | | |
| **High Flow Pulses** | Qp: 3,160 cfs with Average Frequency 1 per year<br>Regressed Volume is 26,600<br>Duration Bound is 29 | | | | | | | | | | | |
| | Qp: 830 cfs with Average Frequency 1 per season<br>Regressed Volume is 6,330<br>Duration Bound is 16 | | | Qp: 1,670 cfs with Average Frequency 1 per season<br>Regressed Volume is 12,300<br>Duration Bound is 19 | | | Qp: 1,030 cfs with Average Frequency 1 per season<br>Regressed Volume is 6,440<br>Duration Bound is 14 | | | Qp: 850 cfs with Average Frequency 1 per season<br>Regressed Volume is 5,690<br>Duration Bound is 14 | | |
| | Qp: 420 cfs with Average Frequency 2 per season<br>Regressed Volume is 2,740<br>Duration Bound is 10 | | | Qp: 840 cfs with Average Frequency 2 per season<br>Regressed Volume is 5,630<br>Duration Bound is 13 | | | Qp: 470 cfs with Average Frequency 2 per season<br>Regressed Volume is 2,650<br>Duration Bound is 10 | | | Qp: 440 cfs with Average Frequency 2 per season<br>Regressed Volume is 2,520<br>Duration Bound is 9 | | |
| **Base Flows (cfs)** | 200 | | | 200 | | | 170 | | | 190 | | |
| | 140 | | | 140 | | | 110 | | | 120 | | |
| | 110 | | | 95 | | | 85 | | | 92 | | |
| **Subsistence Flows (cfs)** | 60 | | | 52 | | | 52 | | | 58 | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| | Winter | | | Spring | | | Summer | | | Fall | | |

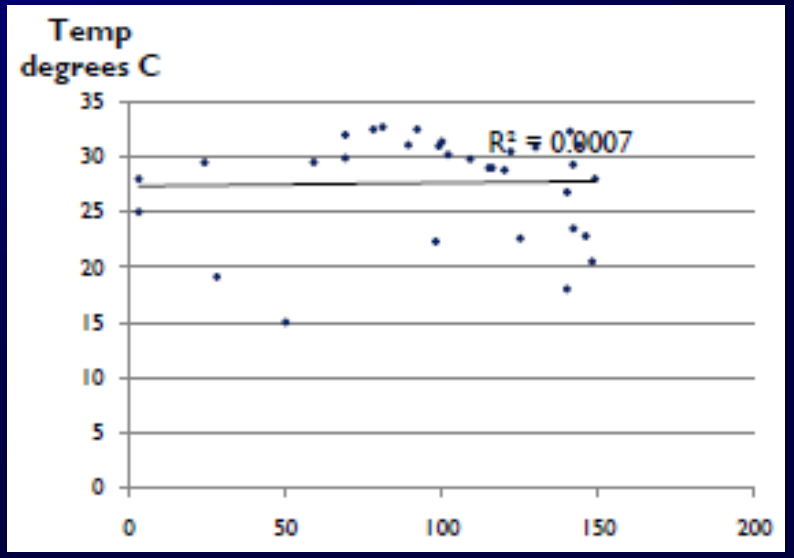
# San Antonio River near Falls City (BBEST)




• One violation of 5 mg/l TCEQ stream standard for dissolved oxygen measured at lowest flows (cfs).

• TPWD has Moderate concern with BBEST subsistence flows (No Habitat Model, LSAR WQ Model = 80 cfs).

• Some violations of 90 degF TCEQ stream standard for temperature measured at lowest flows (cfs).



# San Antonio River near Falls City (TIFP)

**FALLS CITY**

**Overbank Flow**

Magnitude = 11,500 cfs
Frequency = 1 event
Duration = 2 days

*Key Indicators:*
*Riparian: Inundates approx. 90% of hardwood forest community*
*Sediment transport: Channel maintenance*

Magnitude = 8,000 cfs
Frequency = 1 event
Duration = 2 days

*Key Indicators:*
*Riparian: Inundates approx. 80% of hardwood forest community*
*Sediment transport: Channel maintenance*

**High Flow Pulses**

Magnitude = 6,500 cfs
Frequency = 2 events
Duration = 2-3 days

*Key Indicators:*
*Riparian: Green Ash / Box Elder*

*Key Indicators: Riparian - Sycamore*
Magnitude = 4,000 cfs
Frequency = 2 events
Duration = 2-5 days

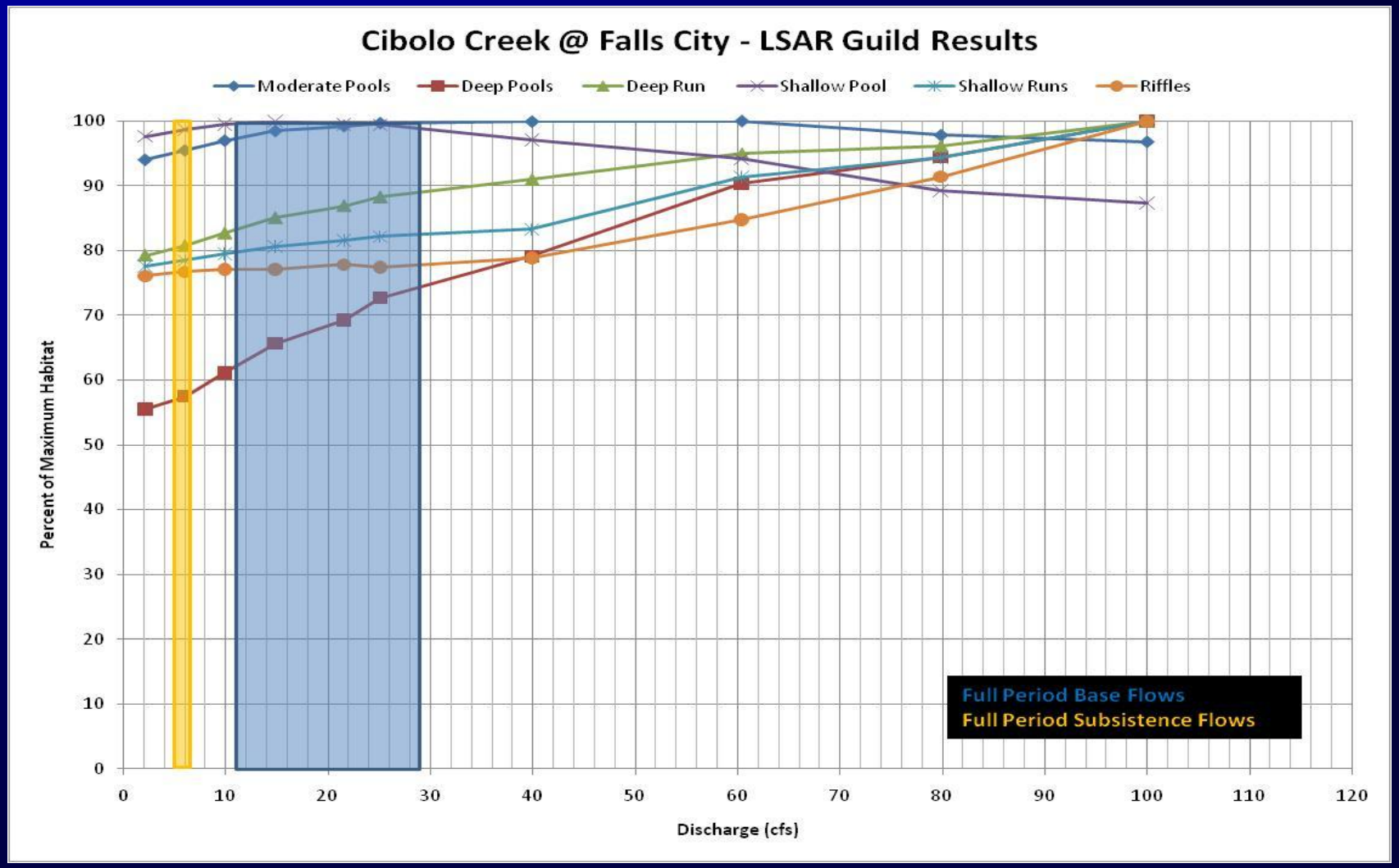
Magnitude = 4,000 cfs
Frequency = 3 events
Duration = 2-5 days
*Key Indicators: Riparian - Black Willow*

| BASE FLOWS (cfs) - Aquatic Habitat protection (intra- and interannual variability) | | | | | | | | | Key Indicators: Aquatic Habitat, Water Quality | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Base Wet** | 429 | 429 | 413 | 427 | 487 | 489 | 489 | 380 | 422 | 459 | 511 | 466 |
| **Base Average** | 292 | 296 | 288 | 261 | 281 | 249 | 200 | 177 | 218 | 242 | 244 | 251 |
| **Base Dry** | 152 | 158 | 147 | 142 | 145 | 125 | 103 | 96 | 141 | 105 | 119 | 127 |
| **SUBSISTENCE FLOWS (cfs) - Water quality protection and maintainence of limited aquatic habitat** | | | | | | | | | **Key Indicators: Water Quality, Aquatic Habitat** | | | |
| **Subsistence** | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| **MONTH** | January | February | March | April | May | June | July | August | September | October | November | December |

# Cibolo Creek near Falls City (BBEST)

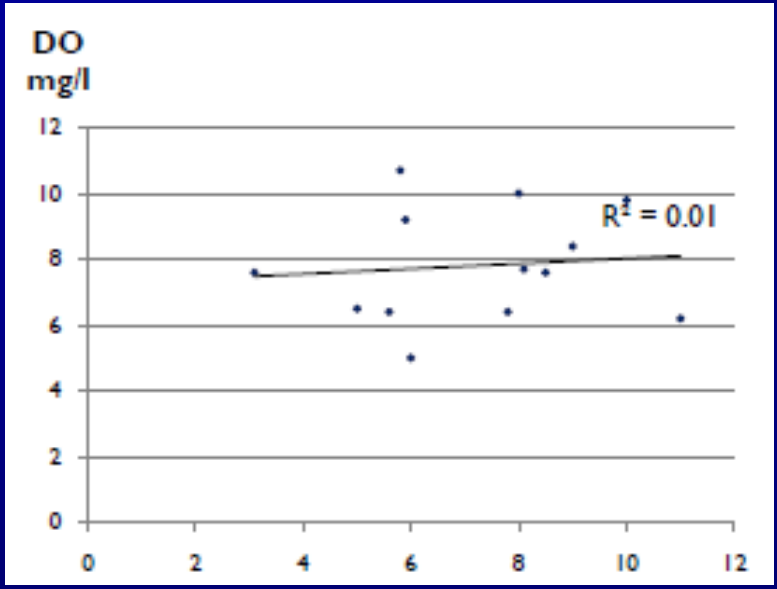
| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overbank Flows** | Qp: 13,500 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 62,800<br>Duration Bound is 42 | | | | | | | | | | | |
| | Qp: 7,220 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 34,200<br>Duration Bound is 35 | | | | | | | | | | | |
| | Qp: 5,160 cfs with Average Frequency 1 per year<br>Regressed Volume is 24,700<br>Duration Bound is 32 | | | | | | | | | | | |
| **High Flow Pulses** | Qp: 570 cfs with Average Frequency 1 per season<br>Regressed Volume is 3,200<br>Duration Bound is 20 | | | Qp: 2,280* cfs with Average Frequency 1 per season<br>Regressed Volume is 10,400<br>Duration Bound is 21 | | | Qp: 390 cfs with Average Frequency 1 per season<br>Regressed Volume is 1,990<br>Duration Bound is 15 | | | Qp: 1,000* cfs with Average Frequency 1 per season<br>Regressed Volume is 5,000<br>Duration Bound is 22 | | |
| | Qp: 140 cfs with Average Frequency 2 per season<br>Regressed Volume is 820<br>Duration Bound is 13 | | | Qp: 670 cfs with Average Frequency 2 per season<br>Regressed Volume is 3,230<br>Duration Bound is 16 | | | Qp: 110 cfs with Average Frequency 2 per season<br>Regressed Volume is 580<br>Duration Bound is 10 | | | Qp: 190 cfs with Average Frequency 2 per season<br>Regressed Volume is 1,000<br>Duration Bound is 13 | | |
| **Base Flows (cfs)** | 29 | | | 27 | | | 22 | | | 27 | | |
| | 23 | | | 19 | | | 15 | | | 20 | | |
| | 17 | | | 13 | | | 11 | | | 13 | | |
| **Subsistence Flows (cfs)** | 6.0 | | | 4.9 | | | 5.0 | | | 6.5 | | |
| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| | **Winter** | | | **Spring** | | | **Summer** | | | **Fall** | | |

# Cibolo Creek near Falls City (BBEST)




- Reasonably high percentages of maximum habitat maintained at BBEST subsistence and base flows.

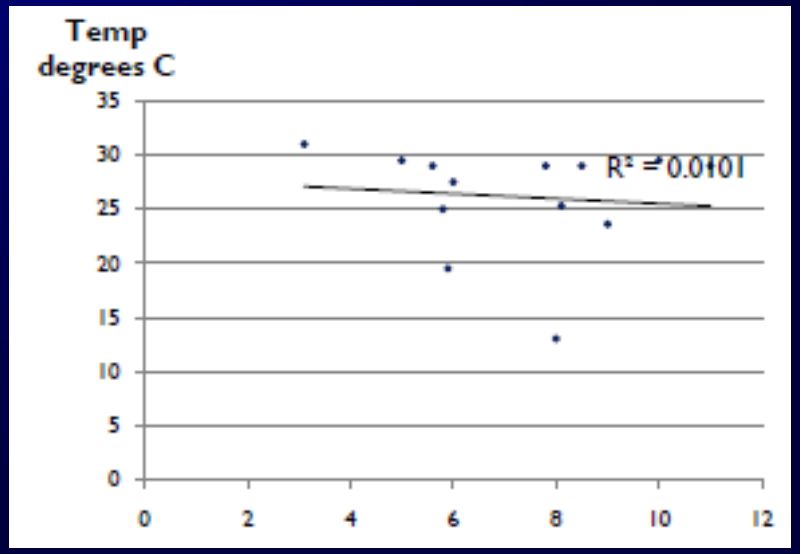
# Cibolo Creek near Falls City (BBEST)




• No violations of 5 mg/l TCEQ stream standard for dissolved oxygen measured at lowest flows (cfs).

• TPWD has Moderate concern with subsistence flows (Some Habitat Guilds < 80% max, Only 1 Habitat Guild < 75% max, LSAR = 7.5 cfs).

• No violations of 90 degF TCEQ stream standard for temperature measured at lowest flows (cfs).



# Cibolo Creek near Falls City (TIFP)

**CIBOLO CREEK**

**Overbank Flow**

Magnitude = 8,000 cfs
Frequency = 1 event
Duration = 2 days

*Key Indicators:*
*Riparian: Inundates approx. 90% of hardwood forest community*
*Sediment transport: Channel maintenance*

Magnitude = 5,000 cfs
Frequency = 1 event
Duration = 2 days

*Key Indicators:*
*Riparian: Inundates approx. 75% of hardwood forest community*
*Sediment transport: Channel maintenance*

**High Flow Pulses**

Magnitude = 2,500 cfs
Frequency = 2 events
Duration = 2-3 days

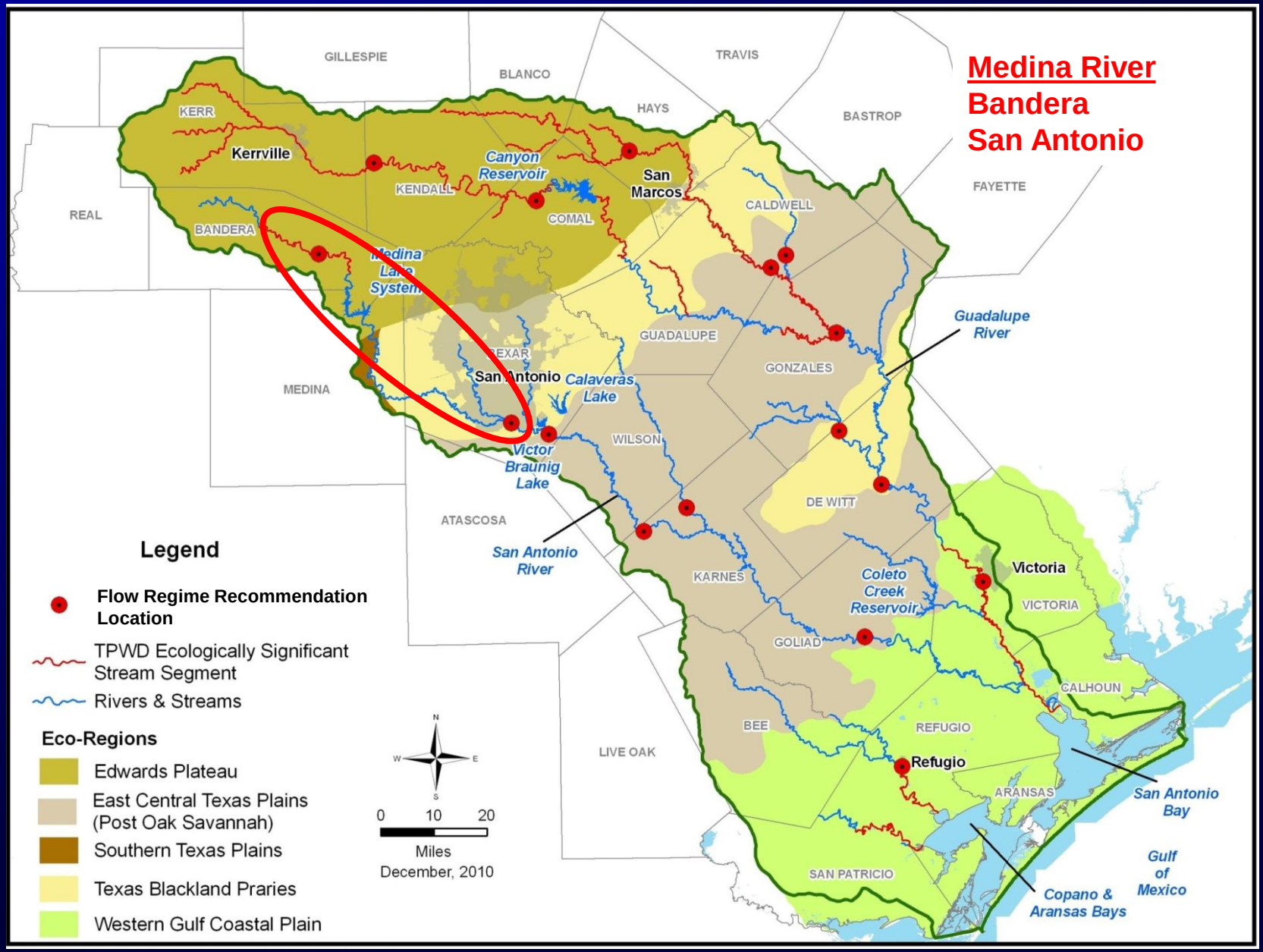
*Key Indicators:*
*Riparian: Green Ash / Box Elder*

Magnitude = 1,000 cfs
Frequency = 3 events
Duration = 2-5 days
*Key Indicators: Riparian - Black Willow*

Magnitude = 1,000 cfs
Frequency = 2 events
Duration = 2-3 days
*Key Indictors: Riparian - Buttonbush*

| BASE FLOWS (cfs) - Aquatic Habitat protection (intra- and interannual variability) | | | | | | | | | Key Indicators: Aquatic Habitat, Water Quality | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Base Wet** | 39 | 41 | 38 | 38 | 48 | 45 | 44 | 31 | 35 | 35 | 43 | 42 |
| **Base Average** | 29 | 28 | 27 | 26 | 29 | 28 | 21 | 17 | 20 | 23 | 25 | 25 |
| **Base Dry** | 19 | 20 | 19 | 18 | 17 | 14 | 11 | 9 | 12 | 13 | 13 | 15 |
| **SUBSISTENCE FLOWS (cfs) - Water quality protection and maintainence of limited aquatic habitat** | | | | | | | | | **Key Indicators: Water Quality, Aquatic Habitat** | | | |
| **Subsistence** | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 |
| **MONTH** | January | February | March | April | May | June | July | August | September | October | November | December |

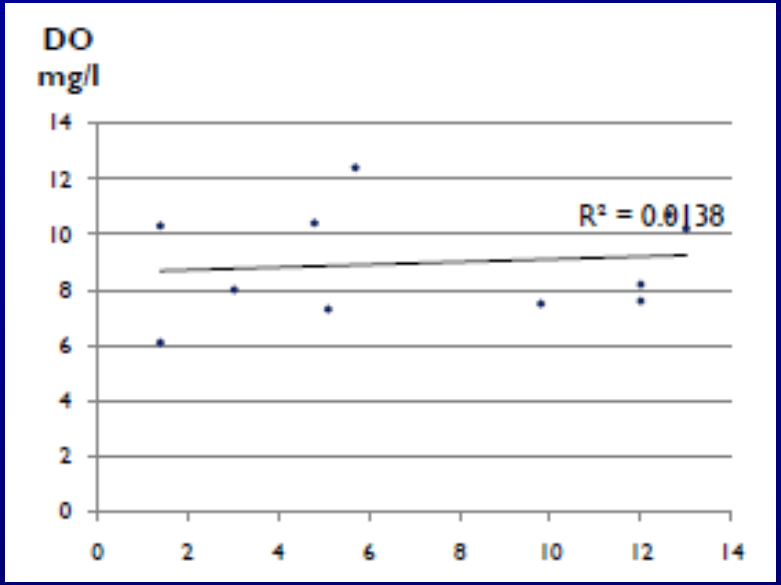
# Group 2:
# Other San Antonio River Basin Locations



# Medina River at Bandera (BBEST)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overbank Flows** | Qp: 6,920 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 50,000<br>Duration Bound is 83 | | | | | | | | | | | |
| | Qp: 3,470 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 34,500<br>Duration Bound is 63 | | | | | | | | | | | |
| **High Flow Pulses** | Qp: 1,890 cfs with Average Frequency 1 per year<br>Regressed Volume is 18,000<br>Duration Bound is 50 | | | | | | | | | | | |
| | Qp: 110 cfs with Average Frequency 1 per season<br>Regressed Volume is 960<br>Duration Bound is 17 | | | Qp: 480 cfs with Average Frequency 1 per season<br>Regressed Volume is 4,190<br>Duration Bound is 28 | | | Qp: 340 cfs with Average Frequency 1 per season<br>Regressed Volume is 2,310<br>Duration Bound is 21 | | | Qp: 220 cfs with Average Frequency 1 per season<br>Regressed Volume is 1,930<br>Duration Bound is 24 | | |
| | Qp: 53 cfs with Average Frequency 2 per season<br>Regressed Volume is 400<br>Duration Bound is 12 | | | Qp: 110 cfs with Average Frequency 2 per season<br>Regressed Volume is 900<br>Duration Bound is 17 | | | Qp: 94 cfs with Average Frequency 2 per season<br>Regressed Volume is 670<br>Duration Bound is 14 | | | Qp: 68 cfs with Average Frequency 2 per season<br>Regressed Volume is 500<br>Duration Bound is 14 | | |
| **Base Flows (cfs)** | 54 | | | 48 | | | 41 | | | 49 | | |
| | 32 | | | 22 | | | 16 | | | 33 | | |
| | 17 | | | 9.8 | | | 6.2 | | | 16 | | |
| **Subsistence Flows (cfs)** | 1.1 | | | 1.0 | | | 1.2 | | | 1.0 | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| | Winter | | | Spring | | | Summer | | | Fall | | |

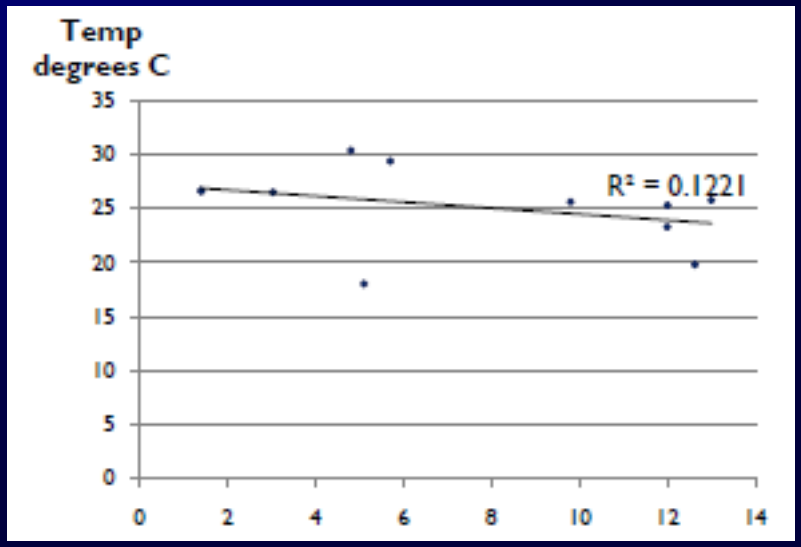
# Medina River at Bandera (BBEST)




• No violations of 6 mg/l TCEQ stream standard for dissolved oxygen measured at lowest flows (cfs).

• TPWD has High concern with BBEST subsistence flows (Some Habitat Guilds < 20% max). Comparative Cross-section Method (CCM) flow-habitat relationships only.

• No violations of 88 degF TCEQ stream standard for temperature measured at lowest flows (cfs).



# Medina River at San Antonio (BBEST)

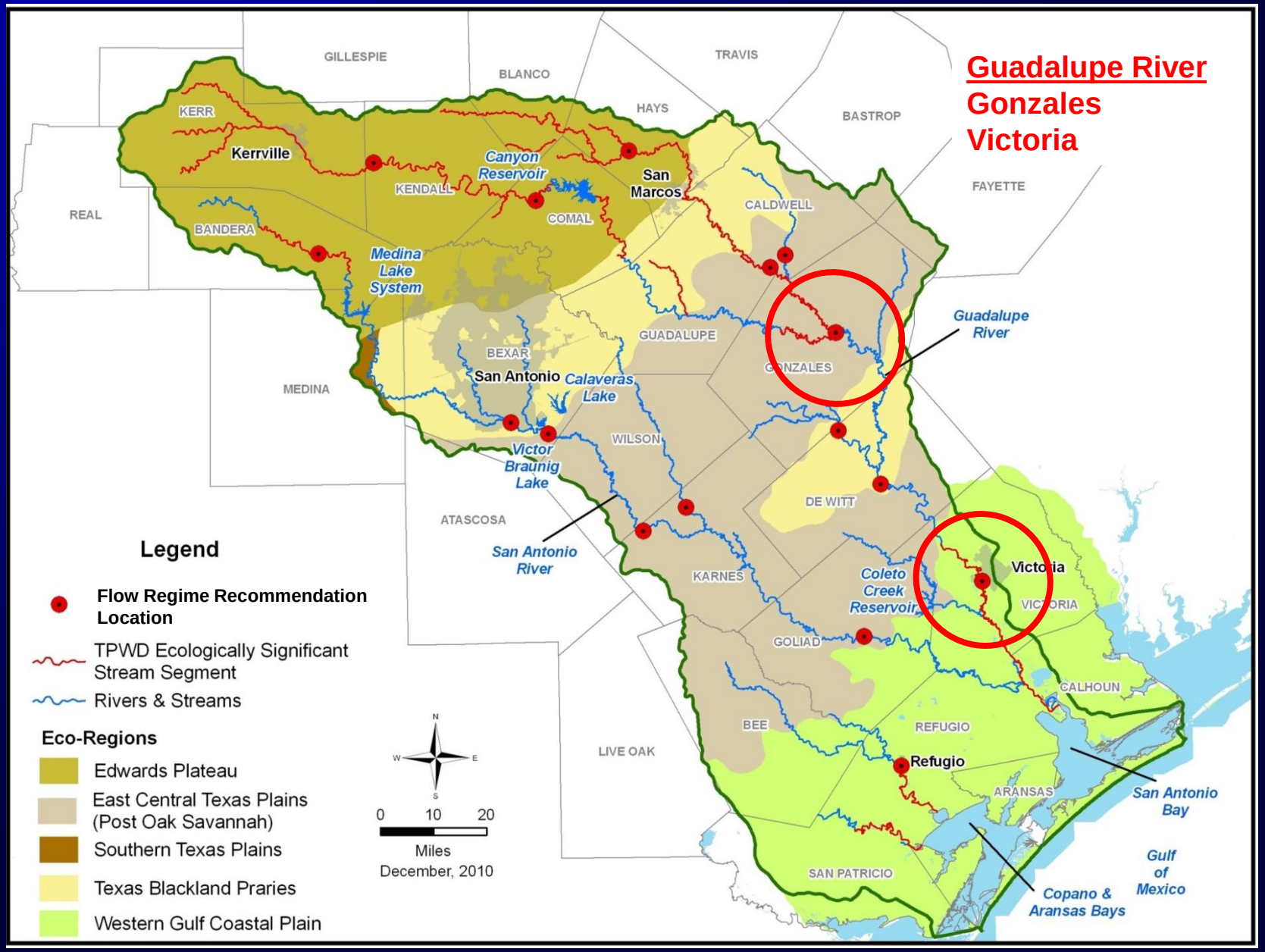
| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overbank Flows** | Qp: 9,940 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 123,000<br>Duration Bound is 107 | | | | | | | | | | | |
| | Qp: 6,020 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 69,300<br>Duration Bound is 83 | | | | | | | | | | | |
| **High Flow Pulses** | Qp: 2,920 cfs with Average Frequency 1 per year<br>Regressed Volume is 30,400<br>Duration Bound is 58 | | | | | | | | | | | |
| | Qp: 350 cfs with Average Frequency 1 per season<br>Regressed Volume is 3,570<br>Duration Bound is 27 | | | Qp: 1,000 cfs with Average Frequency 1 per season<br>Regressed Volume is 7,950<br>Duration Bound is 27 | | | Qp: 440 cfs with Average Frequency 1 per season<br>Regressed Volume is 3,050<br>Duration Bound is 21 | | | Qp: 450 cfs with Average Frequency 1 per season<br>Regressed Volume is 3,890<br>Duration Bound is 28 | | |
| | Qp: 120 cfs with Average Frequency 2 per season<br>Regressed Volume is 970<br>Duration Bound is 15 | | | Qp: 380 cfs with Average Frequency 2 per season<br>Regressed Volume is 2,680<br>Duration Bound is 17 | | | Qp: 140 cfs with Average Frequency 2 per season<br>Regressed Volume is 860<br>Duration Bound is 12 | | | Qp: 130 cfs with Average Frequency 2 per season<br>Regressed Volume is 930<br>Duration Bound is 14 | | |
| **Base Flows (cfs)** | 71 | | | 77 | | | 72 | | | 74 | | |
| | 53 | | | 62 | | | 57 | | | 60 | | |
| | 20 | | | 37 | | | 33 | | | 27 | | |
| **Subsistence Flows (cfs)** | 7.9 | | | 7.6 | | | 7.0 | | | 7.4 | | |
| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| | **Winter** | | | **Spring** | | | **Summer** | | | **Fall** | | |

# *Medina River at San Antonio (BBEST)*

- No available measurements of dissolved oxygen or temperature at BBEST subsistence flow levels.

- TPWD has High concern with BBEST subsistence flows (All Habitat Guilds < 50% max, 1 Habitat Guild < 20% max). Comparative Cross-section Method (CCM) flow-habitat relationships only.

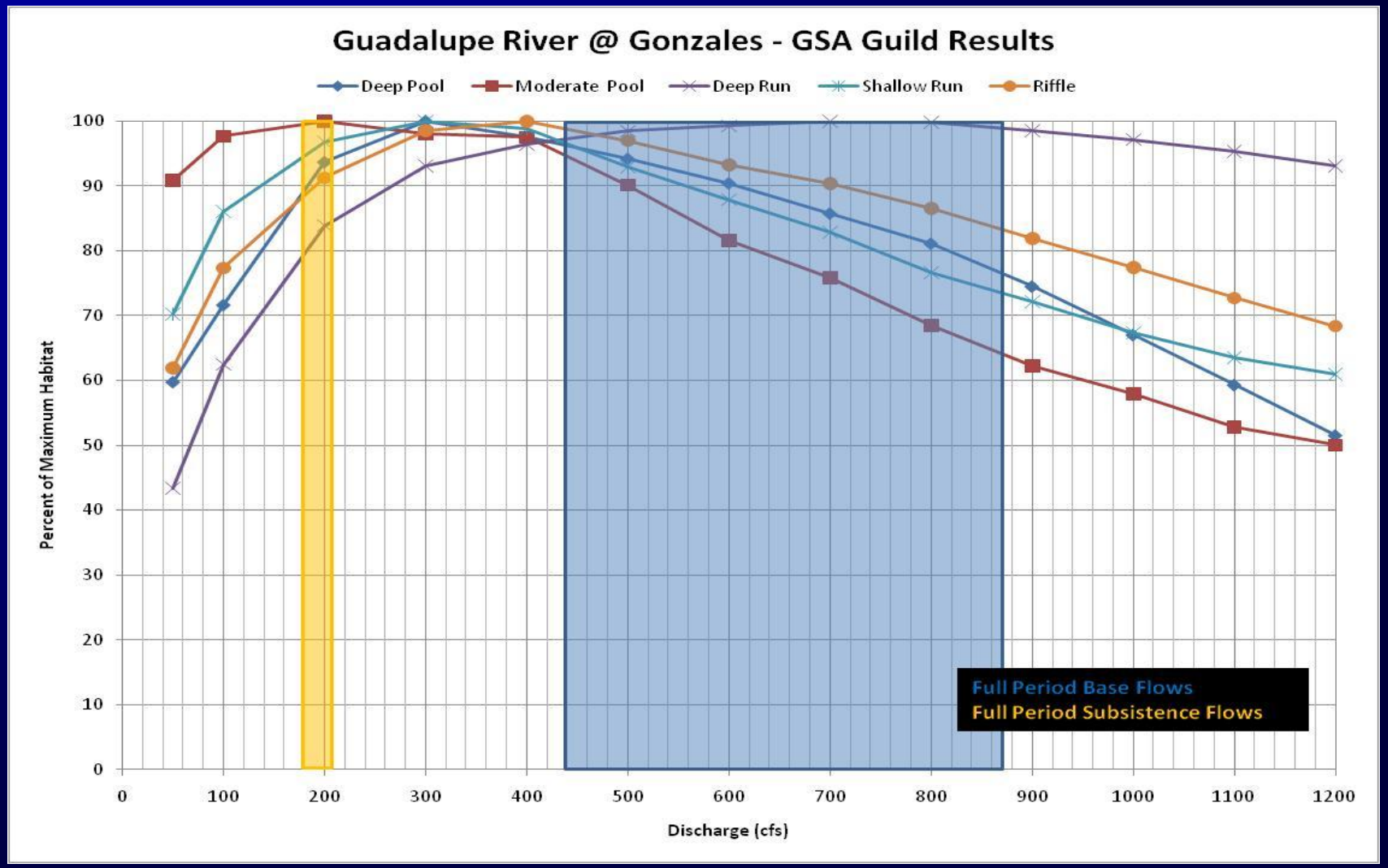
# Group 3:
# Guadalupe River Basin Locations w/ Site-Specific Habitat Information



# Guadalupe River at Gonzales (BBEST)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overbank Flows** | Qp: 36,700 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 492,000<br>Duration Bound is 70 | | | | | | | | | | | |
| | Qp: 24,400 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 306,000<br>Duration Bound is 57 | | | | | | | | | | | |
| | Qp: 14,300 cfs with Average Frequency 1 per year<br>Regressed Volume is 165,000<br>Duration Bound is 43 | | | | | | | | | | | |
| **High Flow Pulses** | Qp: 4,140 cfs with Average Frequency 1 per season<br>Regressed Volume is 48,300<br>Duration Bound is 29 | | | Qp: 6,590 cfs with Average Frequency 1 per season<br>Regressed Volume is 58,400<br>Duration Bound is 24 | | | Qp: 1,760 cfs with Average Frequency 1 per season<br>Regressed Volume is 14,800<br>Duration Bound is 14 | | | Qp: 4,330 cfs with Average Frequency 1 per season<br>Regressed Volume is 41,200<br>Duration Bound is 23 | | |
| | Qp: 1,150 cfs with Average Frequency 2 per season<br>Regressed Volume is 9,640<br>Duration Bound is 13 | | | Qp: 3,250 cfs with Average Frequency 2 per season<br>Regressed Volume is 26,900<br>Duration Bound is 17 | | | Qp: 950 cfs with Average Frequency 2 per season<br>Regressed Volume is 7,060<br>Duration Bound is 10 | | | Qp: 1,410 cfs with Average Frequency 2 per season<br>Regressed Volume is 11,400<br>Duration Bound is 13 | | |
| **Base Flows (cfs)** | 860 | | | 870 | | | 800 | | | 810 | | |
| | 690 | | | 650 | | | 650 | | | 690 | | |
| | 540 | | | 440 | | | 440 | | | 510 | | |
| **Subsistence Flows (cfs)** | 210 | | | 210 | | | 210 | | | 180 | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| | Winter | | | Spring | | | Summer | | | Fall | | |

# Guadalupe River at Gonzales (BBEST)



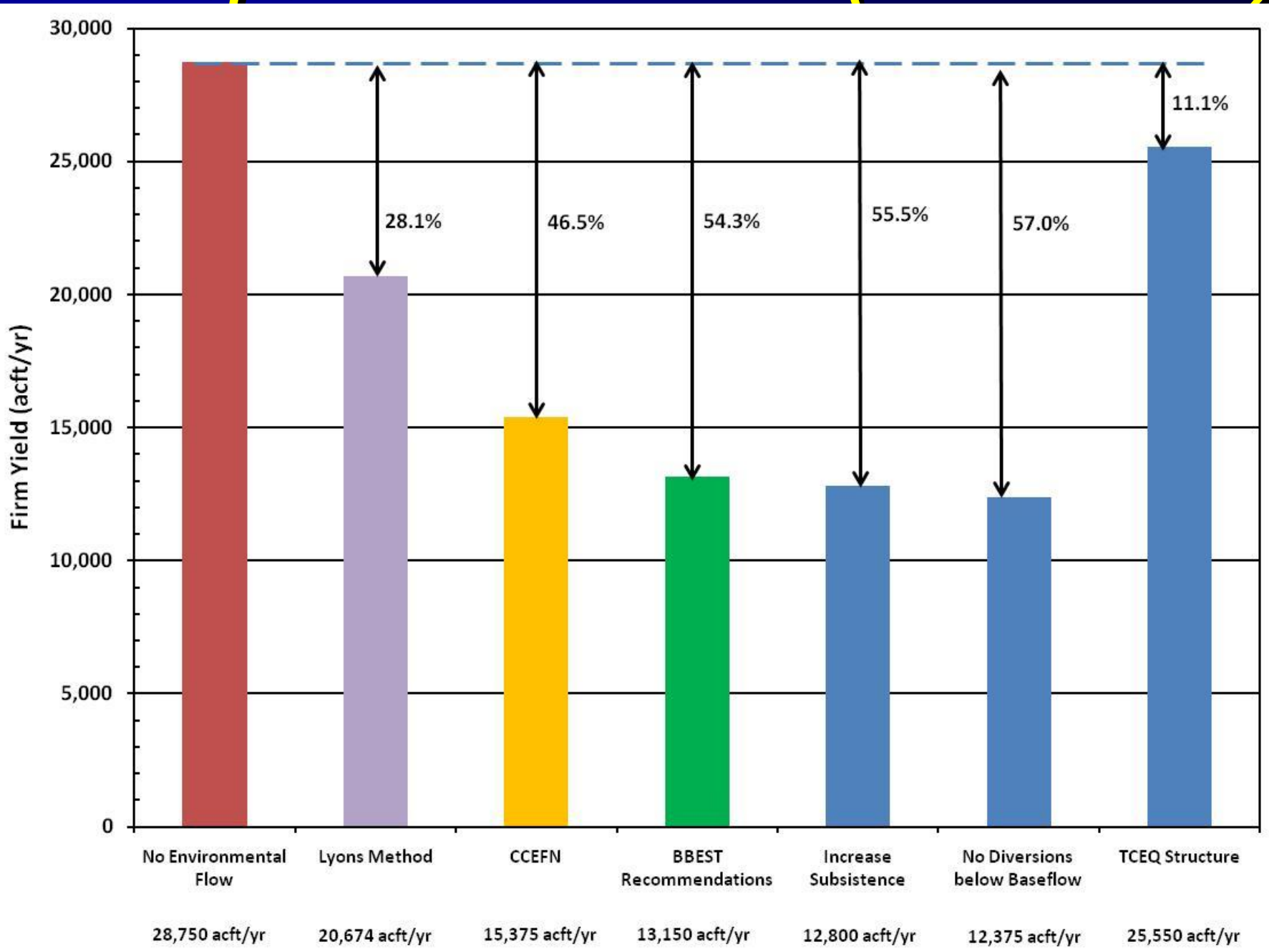

- High percentages of maximum habitat maintained at BBEST subsistence and base flows.

# *Guadalupe River at Gonzales (BBEST)*

- No available measurements of dissolved oxygen or temperature at BBEST subsistence flow levels.

- TPWD has Low-Moderate concern with BBEST subsistence flows (All Habitat Guilds > 80% max).
- Supplemental evaluations of flow-habitat relationships by Dr. Hardy.

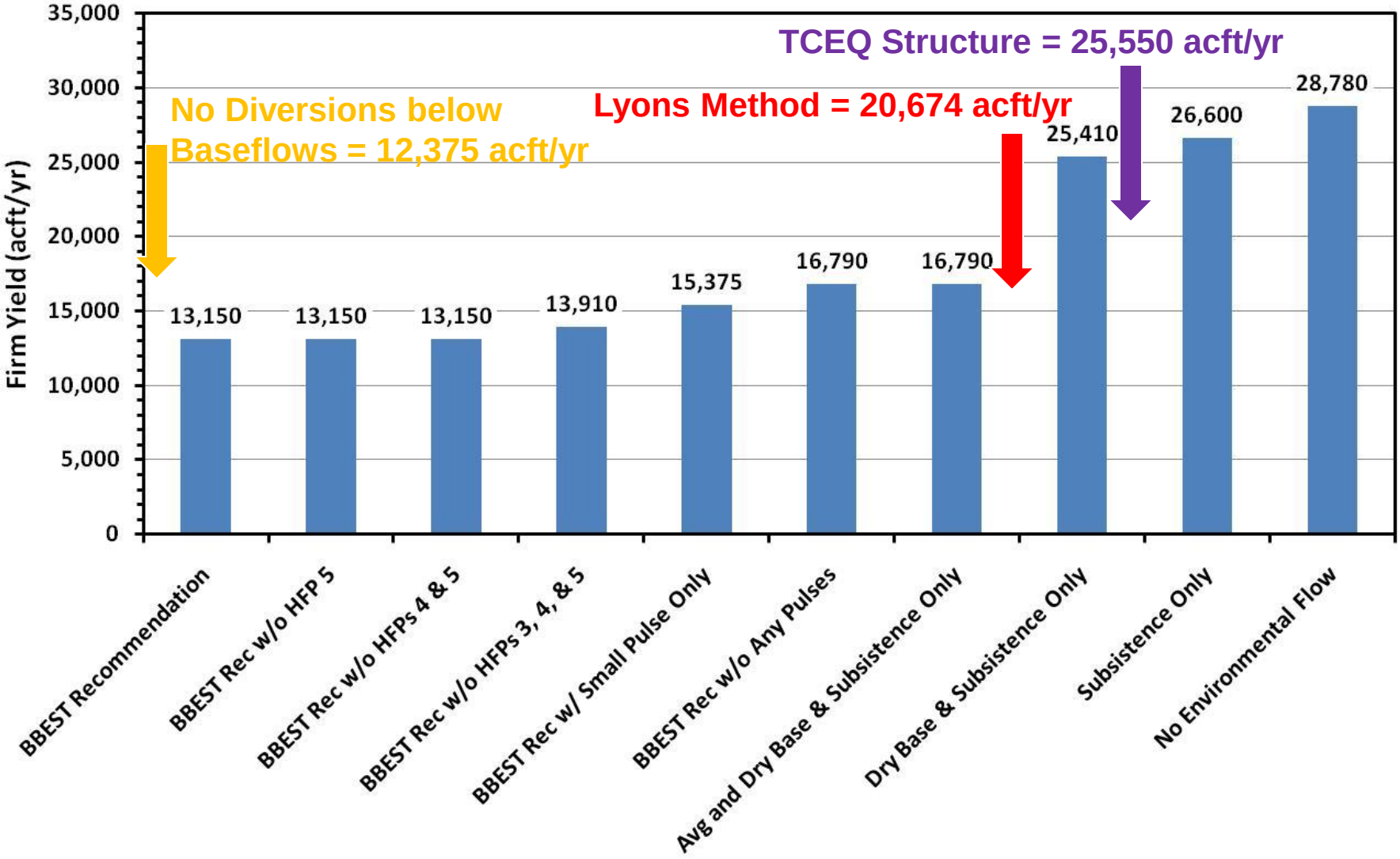
# Guadalupe River at Gonzales (BBASC Work)



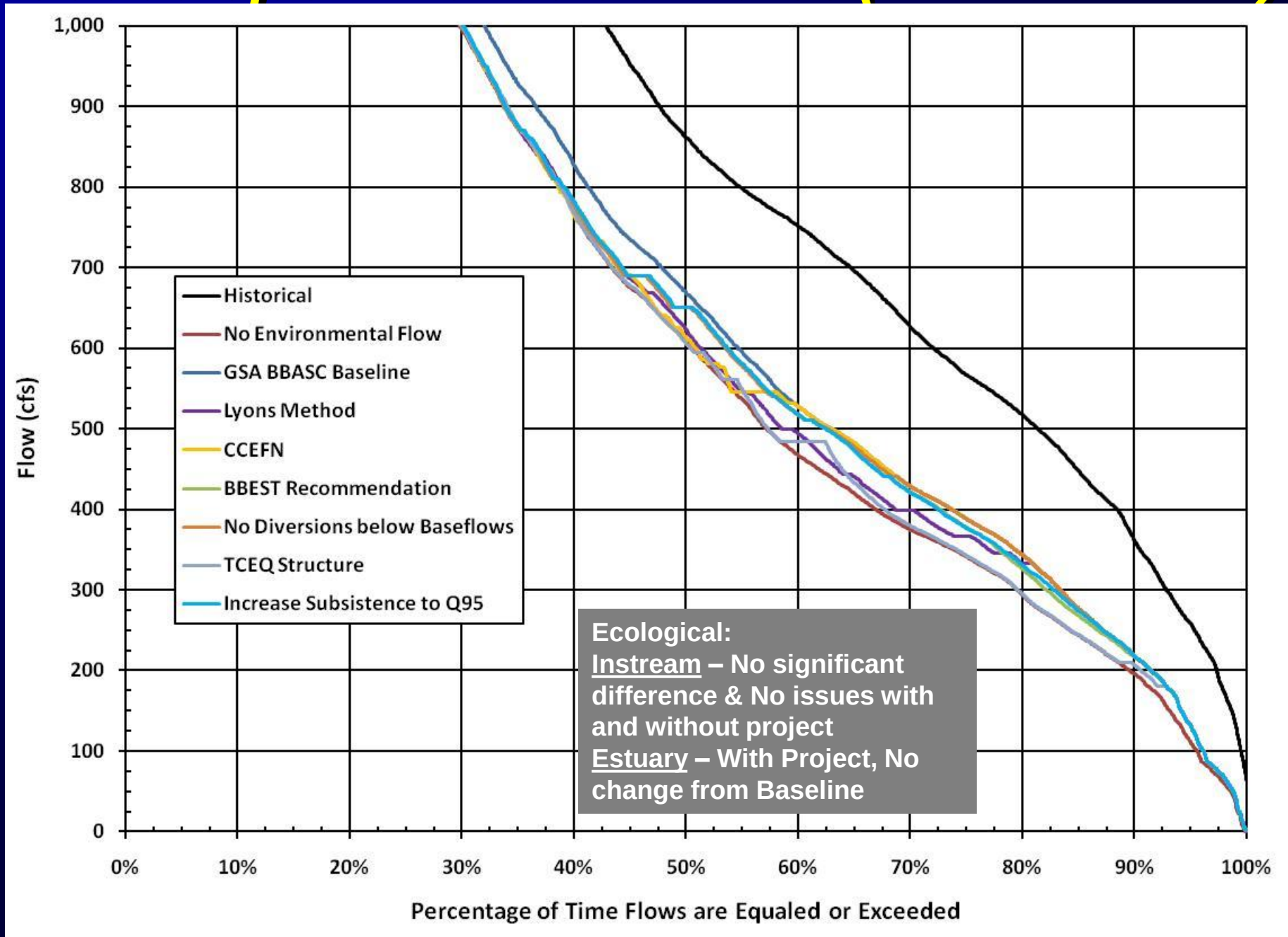
# Guadalupe River at Gonzales (BBASC Work)

| | No Environmental Flow | Lyons Method | CCEFN | BBEST Recommendation | BBEST - No Diversions below Baseflow | TCEQ Structure |
|---|---|---|---|---|---|---|
| Available Project Yield (acft/yr) | 28,750 | 20,674 | 15,375 | 13,150 | 12,375 | 25,550 |
| | | | | | | |
| **Raw Water at Reservoir** | | | | | | |
| Total Project Cost | $253,801,000 | $253,801,000 | $253,801,000 | $253,801,000 | $253,801,000 | $253,801,000 |
| Total Annual Cost | $22,908,000 | $22,854,000 | $22,636,000 | $22,563,000 | $22,564,000 | $22,854,000 |
| Annual Cost of Raw Water ($ per acft) | $797 | $1,105 | $1,472 | $1,716 | $1,823 | $894 |
| Annual Cost of Raw Water ($ per 1,000 gallons) | $2.45 | $3.39 | $4.52 | $5.27 | $5.59 | $2.74 |
| | | | | | | |
| **Treated Water Delivered** | | | | | | |
| Total Project Cost | $475,090,000 | $413,942,000 | $384,892,000 | $369,922,000 | $365,148,000 | $445,076,000 |
| Total Annual Cost | $49,713,000 | $42,891,000 | $38,912,000 | $37,123,000 | $36,385,000 | $47,142,000 |
| Annual Cost of Water ($ per acft) | $1,729 | $2,075 | $2,531 | $2,823 | $2,940 | $1,849 |
| Annual Cost of Water ($ per 1,000 gallons) | $5.31 | $6.37 | $7.77 | $8.66 | $9.02 | $5.67 |

# Guadalupe River at Gonzales (BBASC Work)



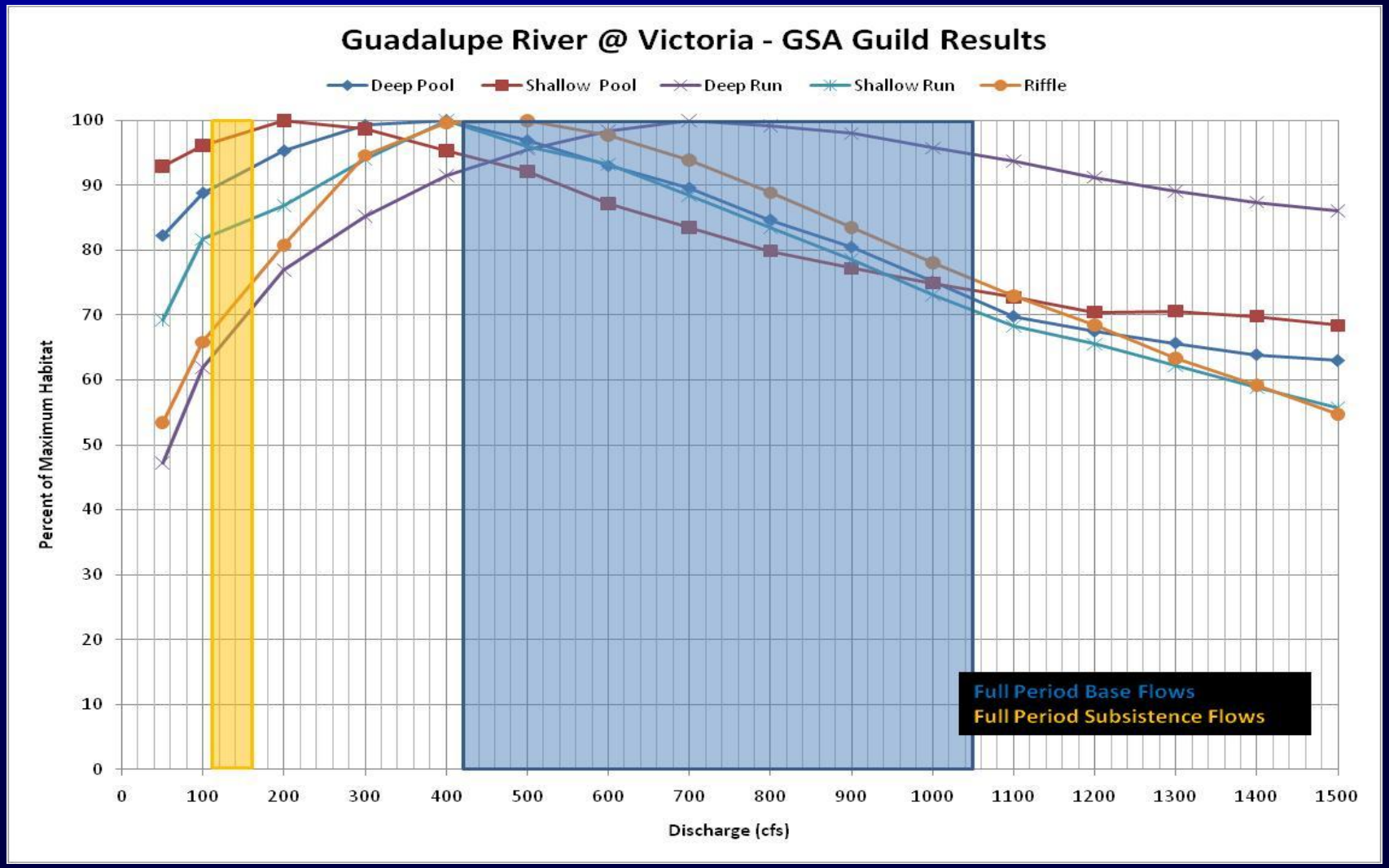
# Guadalupe River at Gonzales (BBASC Work)



# Guadalupe River at Victoria (BBEST)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overbank Flows** | Qp: 48,000 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 971,000<br>Duration Bound is 96 | | | | | | | | | | | |
| | Qp: 25,500 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 438,000<br>Duration Bound is 66 | | | | | | | | | | | |
| | Qp: 16,700 cfs with Average Frequency 1 per year<br>Regressed Volume is 257,000<br>Duration Bound is 51 | | | | | | | | | | | |
| **High Flow Pulses** | Qp: 4,620 cfs with Average Frequency 1 per season<br>Regressed Volume is 56,100<br>Duration Bound is 26 | | | Qp: 9,020* cfs with Average Frequency 1 per season<br>Regressed Volume is 119,000<br>Duration Bound is 34 | | | Qp: 2,060 cfs with Average Frequency 1 per season<br>Regressed Volume is 19,200<br>Duration Bound is 16 | | | Qp: 5,370 cfs with Average Frequency 1 per season<br>Regressed Volume is 57,800<br>Duration Bound is 23 | | |
| | Qp: 1,690 cfs with Average Frequency 2 per season<br>Regressed Volume is 14,400<br>Duration Bound is 13 | | | Qp: 3,300 cfs with Average Frequency 2 per season<br>Regressed Volume is 33,000<br>Duration Bound is 18 | | | Qp: 1,040 cfs with Average Frequency 2 per season<br>Regressed Volume is 8,570<br>Duration Bound is 11 | | | Qp: 1,880 cfs with Average Frequency 2 per season<br>Regressed Volume is 15,600<br>Duration Bound is 13 | | |
| **Base Flows (cfs)** | 1,050 | | | 1,020 | | | 870 | | | 940 | | |
| | 800 | | | 710 | | | 630 | | | 720 | | |
| | 580 | | | 450 | | | 420 | | | 510 | | |
| **Subsistence Flows (cfs)** | 160 | | | 130 | | | 150 | | | 110 | | |
| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| | **Winter** | | | **Spring** | | | **Summer** | | | **Fall** | | |

# Guadalupe River at Victoria (BBEST)



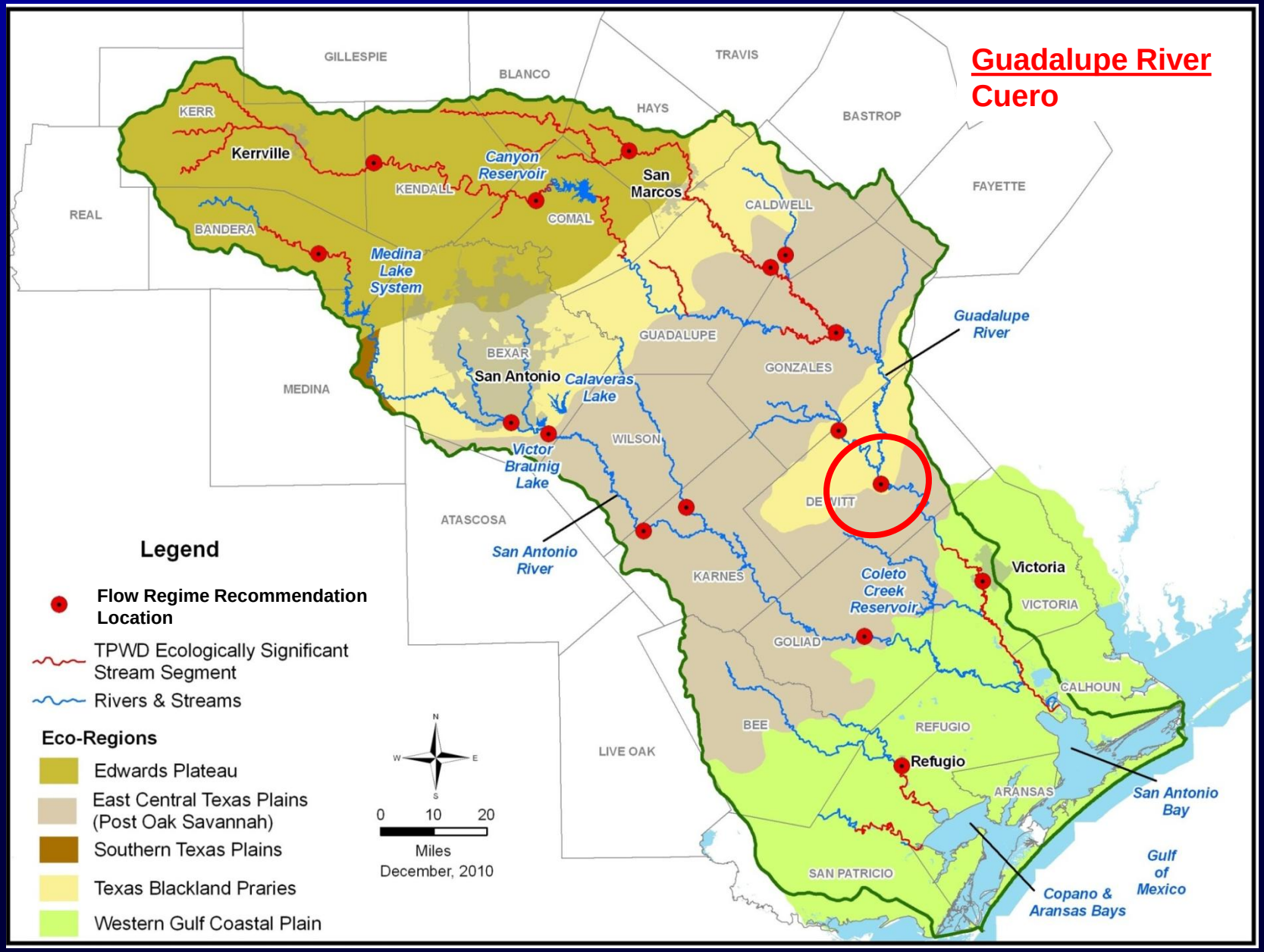

- High percentages of maximum habitat maintained at BBEST subsistence and base flows.

# *Guadalupe River at Victoria (BBEST)*

- No available measurements of dissolved oxygen or temperature at BBEST subsistence flow levels.

- TPWD has Moderate concern with BBEST subsistence flows (Some Habitat Guilds < 80% max).
- Supplemental evaluations of flow-habitat relationships by Dr. Hardy.

# Group 4:
# Guadalupe River Basin Locations – Cuero



# Guadalupe River at Cuero (BBEST)

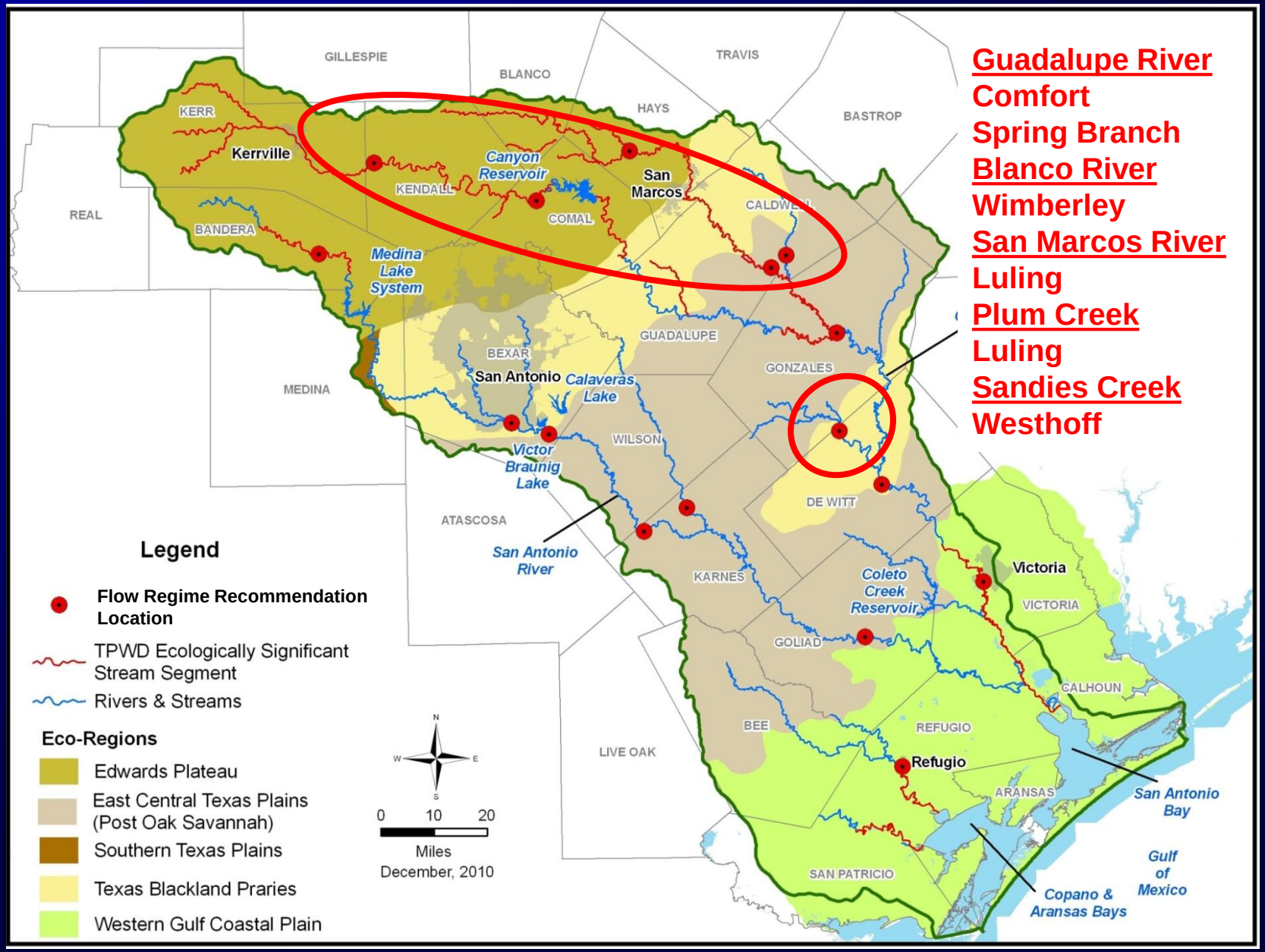
| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overbank Flows** | Qp: 45,400 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 869,000<br>Duration Bound is 91 | | | | | | | | | | | |
| | Qp: 24,700 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 406,000<br>Duration Bound is 64 | | | | | | | | | | | |
| | Qp: 16,600 cfs with Average Frequency 1 per year<br>Regressed Volume is 247,000<br>Duration Bound is 50 | | | | | | | | | | | |
| **High Flow Pulses** | Qp: 4,610 cfs with Average Frequency 1 per season<br>Regressed Volume is 55,300<br>Duration Bound is 26 | | | Qp: 8,870 cfs with Average Frequency 1 per season<br>Regressed Volume is 110,000<br>Duration Bound is 32 | | | Qp: 2,110 cfs with Average Frequency 1 per season<br>Regressed Volume is 19,300<br>Duration Bound is 17 | | | Qp: 5,200 cfs with Average Frequency 1 per season<br>Regressed Volume is 54,700<br>Duration Bound is 23 | | |
| | Qp: 1,610 cfs with Average Frequency 2 per season<br>Regressed Volume is 14,100<br>Duration Bound is 13 | | | Qp: 3,370 cfs with Average Frequency 2 per season<br>Regressed Volume is 31,800<br>Duration Bound is 18 | | | Qp: 1,050 cfs with Average Frequency 2 per season<br>Regressed Volume is 8,300<br>Duration Bound is 12 | | | Qp: 1,730 cfs with Average Frequency 2 per season<br>Regressed Volume is 14,100<br>Duration Bound is 13 | | |
| **Base Flows (cfs)** | 980 | | | 940 | | | 800 | | | 870 | | |
| | 760 | | | 680 | | | 600 | | | 670 | | |
| | 550 | | | 410 | | | 390 | | | 480 | | |
| **Subsistence Flows (cfs)** | 130 | | | 120 | | | 130 | | | 86 | | |
| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| | **Winter** | | | **Spring** | | | **Summer** | | | **Fall** | | |

# *Guadalupe River at Cuero (BBEST)*

- No available measurements of dissolved oxygen or temperature at BBEST subsistence flow levels.

- TPWD has Moderate concern with BBEST subsistence flows (Model uncertainty high). Comparative Cross-section Method (CCM) flow-habitat relationships only.

# Group 5:
# Other Guadalupe River Basin Locations



# Guadalupe River at Comfort (BBEST)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overbank Flows** | Qp: 15,900 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 100,000<br>Duration Bound is 97 | | | | | | | | | | | |
| | Qp: 7,420 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 72,400<br>Duration Bound is 69 | | | | | | | | | | | |
| **High Flow Pulses** | Qp: 4,020 cfs with Average Frequency 1 per year<br>Regressed Volume is 37,400<br>Duration Bound is 53 | | | | | | | | | | | |
| | Qp: 350 cfs with Average Frequency 1 per season<br>Regressed Volume is 3,390<br>Duration Bound is 20 | | | Qp: 1,190 cfs with Average Frequency 1 per season<br>Regressed Volume is 8,950<br>Duration Bound is 26 | | | Qp: 570 cfs with Average Frequency 1 per season<br>Regressed Volume is 4,110<br>Duration Bound is 19 | | | Qp: 500 cfs with Average Frequency 1 per season<br>Regressed Volume is 4,060<br>Duration Bound is 24 | | |
| | Qp: 140 cfs with Average Frequency 2 per season<br>Regressed Volume is 1,030<br>Duration Bound is 11 | | | Qp: 400 cfs with Average Frequency 2 per season<br>Regressed Volume is 2,980<br>Duration Bound is 17 | | | Qp: 160 cfs with Average Frequency 2 per season<br>Regressed Volume is 1,130<br>Duration Bound is 12 | | | Qp: 160 cfs with Average Frequency 2 per season<br>Regressed Volume is 1,110<br>Duration Bound is 13 | | |
| **Base Flows (cfs)** | 110 | | | 100 | | | 75 | | | 110 | | |
| | 77 | | | 69 | | | 50 | | | 77 | | |
| | 54 | | | 35 | | | 25 | | | 48 | | |
| **Subsistence Flows (cfs)** | 10 | | | 5.2 | | | 2.0 | | | 2.7 | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| | Winter | | | Spring | | | Summer | | | Fall | | |

# *Guadalupe River at Comfort (BBEST)*

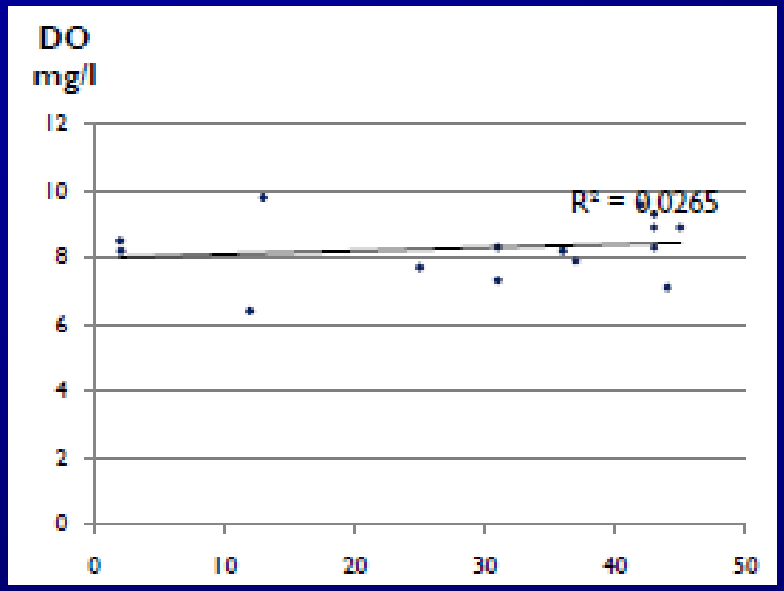
- No available measurements of dissolved oxygen or temperature at BBEST subsistence flow levels.

- TPWD has High concern with BBEST subsistence flows (Minimal habitat). Comparative Cross-section Method (CCM) flow-habitat relationships only.

# Guadalupe River near Spring Branch (BBEST)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **High Flow Pulses** | Qp: 23,700 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 242,000<br>Duration Bound is 82 | | | | | | | | | | | |
| | Qp: 11,300 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 109,000<br>Duration Bound is 60 | | | | | | | | | | | |
| | Qp: 5,720 cfs with Average Frequency 1 per year<br>Regressed Volume is 51,900<br>Duration Bound is 45 | | | | | | | | | | | |
| | Qp: 570 cfs with Average Frequency 1 per season<br>Regressed Volume is 5,150<br>Duration Bound is 19 | | | Qp: 2,310 cfs with Average Frequency 1 per season<br>Regressed Volume is 17,500<br>Duration Bound is 26 | | | Qp: 870 cfs with Average Frequency 1 per season<br>Regressed Volume is 5,970<br>Duration Bound is 19 | | | Qp: 1,000 cfs with Average Frequency 1 per season<br>Regressed Volume is 8,060<br>Duration Bound is 23 | | |
| | Qp: 210 cfs with Average Frequency 2 per season<br>Regressed Volume is 1,520<br>Duration Bound is 11 | | | Qp: 870 cfs with Average Frequency 2 per season<br>Regressed Volume is 6,500<br>Duration Bound is 19 | | | Qp: 240 cfs with Average Frequency 2 per season<br>Regressed Volume is 1,520<br>Duration Bound is 11 | | | Qp: 230 cfs with Average Frequency 2 per season<br>Regressed Volume is 1,660<br>Duration Bound is 12 | | |
| **Base Flows (cfs)** | 160 | | | 160 | | | 110 | | | 150 | | |
| | 100 | | | 91 | | | 64 | | | 100 | | |
| | 70 | | | 44 | | | 36 | | | 57 | | |
| **Subsistence Flows (cfs)** | 13 | | | 6.6 | | | 4.6 | | | 6.6 | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| | Winter | | | Spring | | | Summer | | | Fall | | |

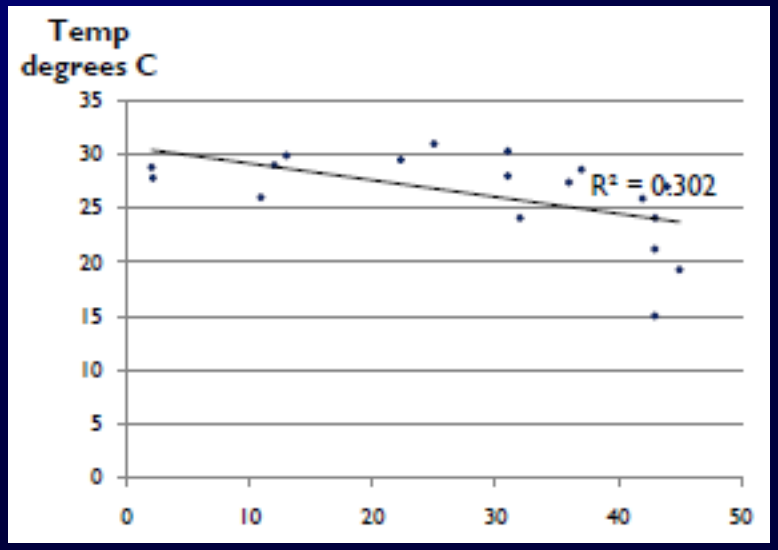
# Guadalupe River near Spring Branch (BBEST)




• No violations of 6 mg/l TCEQ stream standard for dissolved oxygen measured at lowest flows (cfs).

• TPWD has High concern with BBEST subsistence flows (Minimal to Limited Habitat). Comparative Cross-section Method (CCM) flow-habitat relationships only.

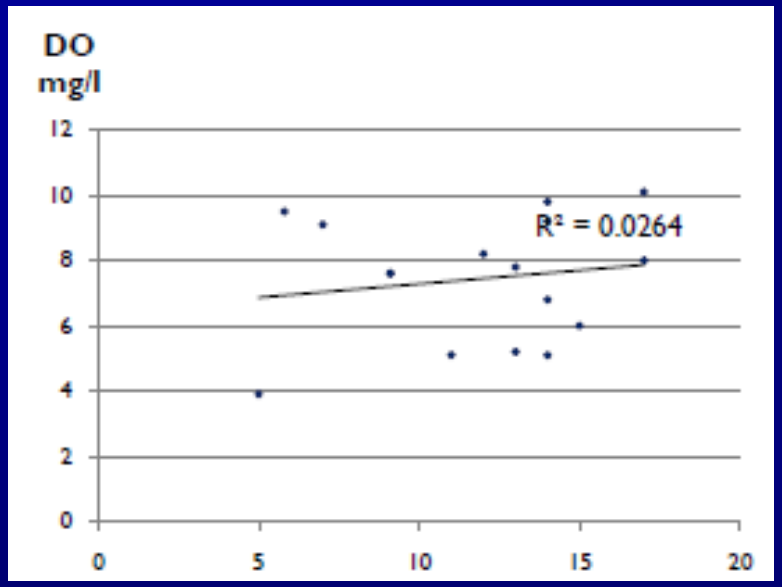
• No violations of 90 degF TCEQ stream standard for temperature measured at lowest flows (cfs).



# Blanco River at Wimberley (BBEST)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **High Flow Pulses** | Qp: 8,310 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 82,000<br>Duration Bound is 74 | | | | | | | | | | | |
| | Qp: 4,640 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 43,100<br>Duration Bound is 58 | | | | | | | | | | | |
| | Qp: 2,820 cfs with Average Frequency 1 per year<br>Regressed Volume is 24,900<br>Duration Bound is 47 | | | | | | | | | | | |
| | Qp: 380 cfs with Average Frequency 1 per season<br>Regressed Volume is 3,840<br>Duration Bound is 28 | | | Qp: 960 cfs with Average Frequency 1 per season<br>Regressed Volume is 6,540<br>Duration Bound is 26 | | | Qp: 190 cfs with Average Frequency 1 per season<br>Regressed Volume is 1,130<br>Duration Bound is 13 | | | Qp: 440 cfs with Average Frequency 1 per season<br>Regressed Volume is 3,220<br>Duration Bound is 21 | | |
| | Qp: 54 cfs with Average Frequency 2 per season<br>Regressed Volume is 360<br>Duration Bound is 10 | | | Qp: 360 cfs with Average Frequency 2 per season<br>Regressed Volume is 2,370<br>Duration Bound is 18 | | | Qp: 74 cfs with Average Frequency 2 per season<br>Regressed Volume is 410<br>Duration Bound is 9 | | | Qp: 82 cfs with Average Frequency 2 per season<br>Regressed Volume is 500<br>Duration Bound is 10 | | |
| **Base Flows (cfs)** | 52 | | | 64 | | | 56 | | | 54 | | |
| | 34 | | | 40 | | | 36 | | | 36 | | |
| | 20 | | | 18 | | | 18 | | | 18 | | |
| **Subsistence Flows (cfs)** | 7.9 | | | 6.7 | | | 7.6 | | | 7.1 | | |
| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| | **Winter** | | | **Spring** | | | **Summer** | | | **Fall** | | |

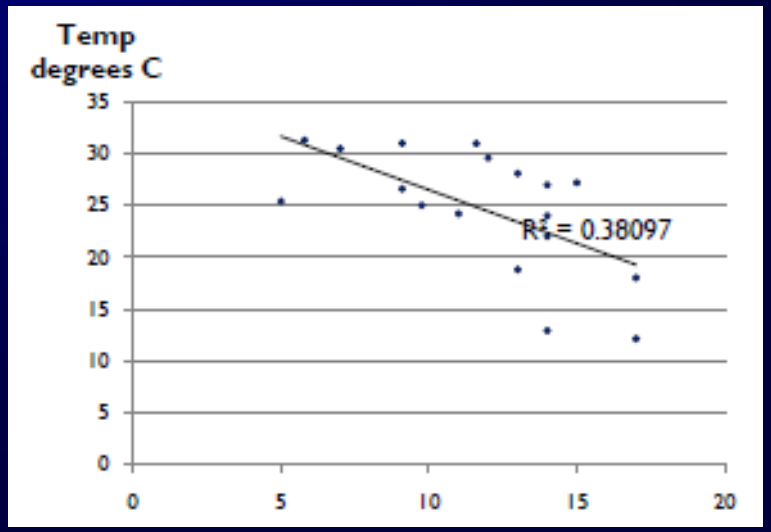
# Blanco River at Wimberley (BBEST)




- Several violations of 6 mg/l TCEQ stream standard for dissolved oxygen measured at lowest flows (cfs).

- TPWD has High concern with BBEST subsistence flows (Minimal to Limited Habitat). Comparative Cross-section Method (CCM) flow-habitat relationships only.

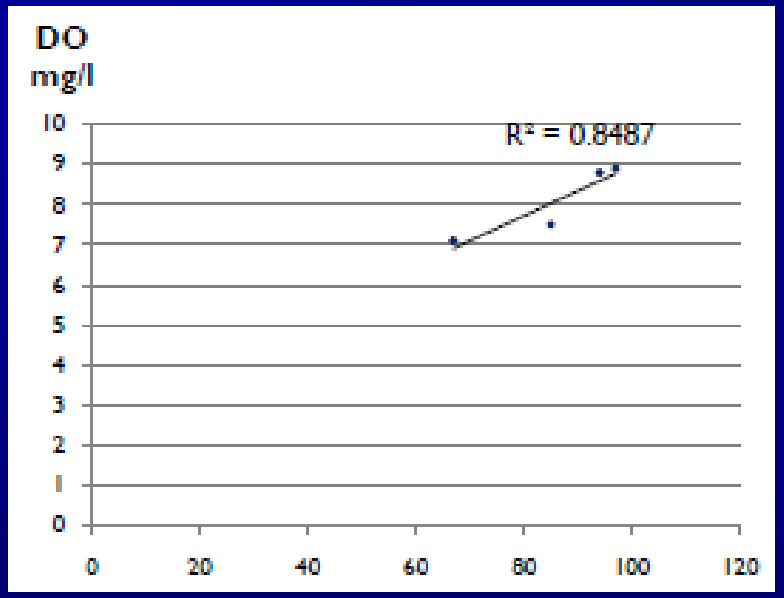
- No violations of 92 degF TCEQ stream standard for temperature measured at lowest flows (cfs).



# San Marcos River at Luling (BBEST)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overbank Flows** | Qp: 17,900 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 208,000<br>Duration Bound is 78 | | | | | | | | | | | |
| | Qp: 10,600 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 110,000<br>Duration Bound is 57 | | | | | | | | | | | |
| | Qp: 6,120 cfs with Average Frequency 1 per year<br>Regressed Volume is 56,400<br>Duration Bound is 41 | | | | | | | | | | | |
| **High Flow Pulses** | Qp: 1,330 cfs with Average Frequency 1 per season<br>Regressed Volume is 11,400<br>Duration Bound is 23 | | | Qp: 2,740 cfs with Average Frequency 1 per season<br>Regressed Volume is 18,400<br>Duration Bound is 21 | | | Qp: 500 cfs with Average Frequency 1 per season<br>Regressed Volume is 2,670<br>Duration Bound is 9 | | | Qp: 1,710 cfs with Average Frequency 1 per season<br>Regressed Volume is 11,200<br>Duration Bound is 18 | | |
| | Qp: 340 cfs with Average Frequency 2 per season<br>Regressed Volume is 1,800<br>Duration Bound is 8 | | | Qp: 1,140 cfs with Average Frequency 2 per season<br>Regressed Volume is 6,800<br>Duration Bound is 14 | | | Qp: 240 cfs with Average Frequency 2 per season<br>Regressed Volume is 1,090<br>Duration Bound is 6 | | | Qp: 540 cfs with Average Frequency 2 per season<br>Regressed Volume is 2,740<br>Duration Bound is 9 | | |
| **Base Flows (cfs)** | 210 | | | 220 | | | 220 | | | 200 | | |
| | 160 | | | 160 | | | 170 | | | 170 | | |
| | 120 | | | 110 | | | 110 | | | 120 | | |
| **Subsistence Flows (cfs)** | 78 | | | 75 | | | 73 | | | 77 | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| | Winter | | | Spring | | | Summer | | | Fall | | |

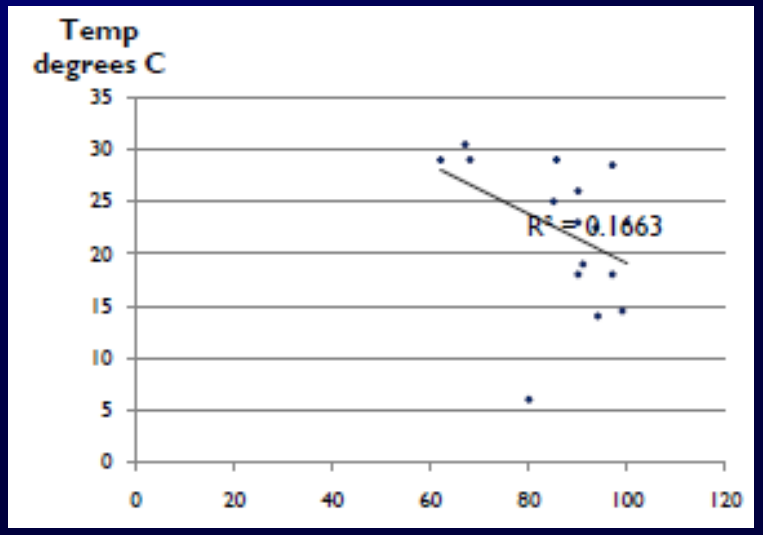
# San Marcos River at Luling (BBEST)




• No violations of 5 mg/l TCEQ stream standard for dissolved oxygen measured at lowest flows (cfs).

• TPWD has Moderate concern with BBEST subsistence flows (No Habitat Model).

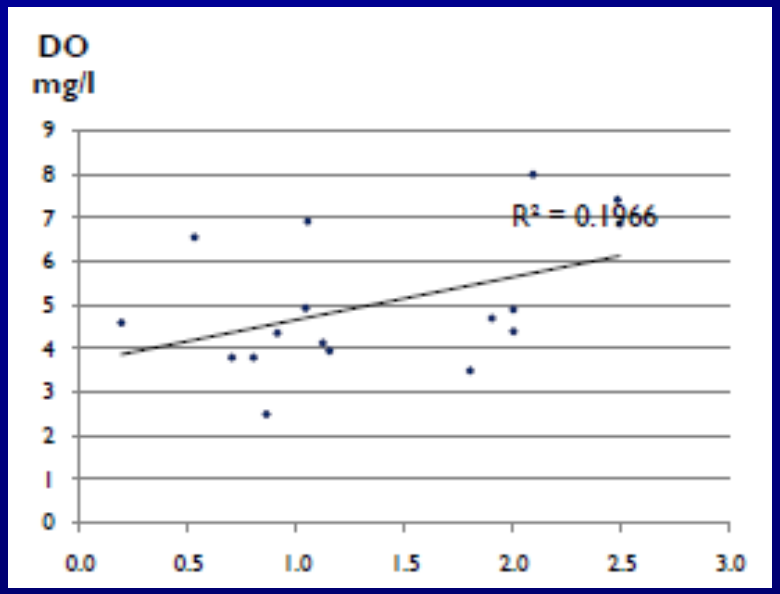
• No violations of 90 degF TCEQ stream standard for temperature measured at lowest flows (cfs).



# Plum Creek near Luling (BBEST)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overbank Flows** | Qp: 10,800 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 43,100<br>Duration Bound is 32 | | | | | | | | | | | |
| | Qp: 7,280 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 29,700<br>Duration Bound is 29 | | | | | | | | | | | |
| **High Flow Pulses** | Qp: 4,550 cfs with Average Frequency 1 per year<br>Regressed Volume is 19,000<br>Duration Bound is 26 | | | | | | | | | | | |
| | Qp: 1,470 cfs with Average Frequency 1 per season<br>Regressed Volume is 6,870<br>Duration Bound is 23 | | | Qp: 2,100 cfs with Average Frequency 1 per season<br>Regressed Volume is 8,860<br>Duration Bound is 21 | | | Qp: 230 cfs with Average Frequency 1 per season<br>Regressed Volume is 1,080<br>Duration Bound is 15 | | | Qp: 750 cfs with Average Frequency 1 per season<br>Regressed Volume is 3,280<br>Duration Bound is 17 | | |
| | Qp: 350 cfs with Average Frequency 2 per season<br>Regressed Volume is 1,800<br>Duration Bound is 17 | | | Qp: 720 cfs with Average Frequency 2 per season<br>Regressed Volume is 3,300<br>Duration Bound is 17 | | | Qp: 48 cfs with Average Frequency 2 per season<br>Regressed Volume is 230<br>Duration Bound is 10 | | | Qp: 150 cfs with Average Frequency 2 per season<br>Regressed Volume is 720<br>Duration Bound is 13 | | |
| **Base Flows (cfs)** | 12 | | | 10 | | | 5.0 | | | 8.3 | | |
| | 8.4 | | | 5.6 | | | 2.5 | | | 5.2 | | |
| | 4.6 | | | 2.6 | | | 1.6 | | | 2.5 | | |
| **Subsistence Flows (cfs)** | 1.0 | | | 1.0 | | | 1.0 | | | 1.0 | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| | Winter | | | Spring | | | Summer | | | Fall | | |

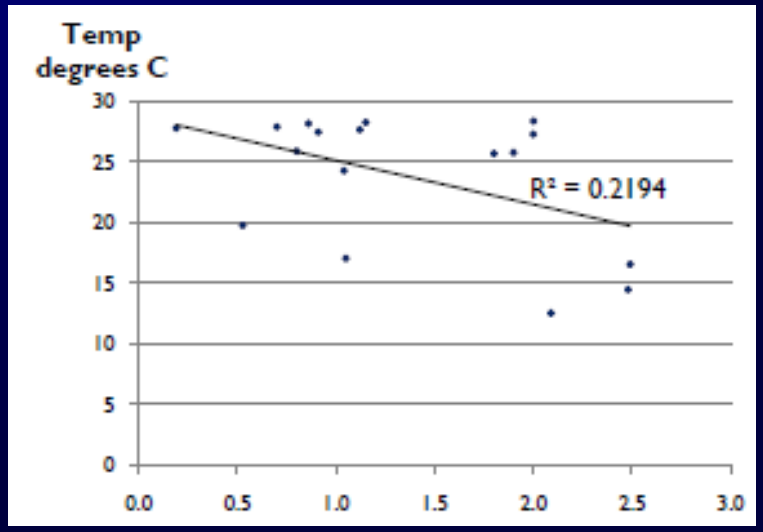
# Plum Creek near Luling (BBEST)




- Many violations of 5 mg/l TCEQ stream standard for dissolved oxygen measured at lowest flows (cfs).

- TPWD has High concern with BBEST subsistence flows (Minimal Habitat). Comparative Cross-section Method (CCM) flow-habitat relationships only.

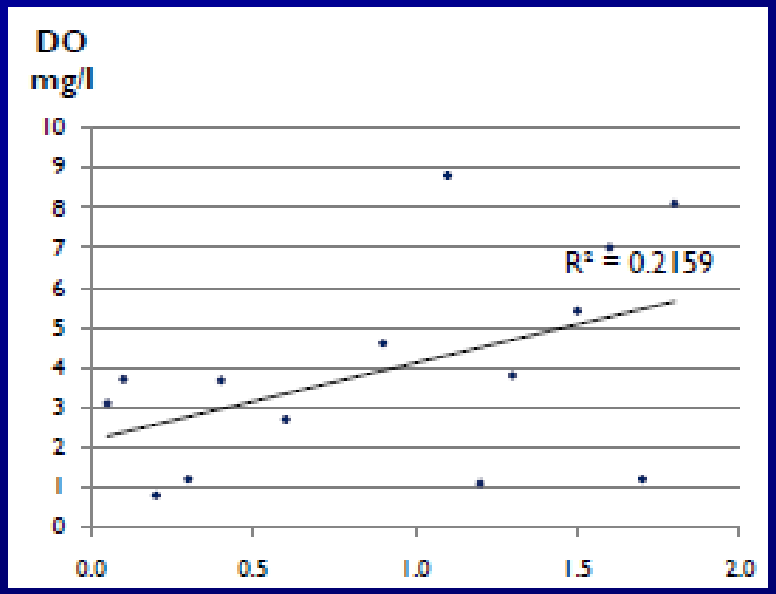
- No violations of 90 degF TCEQ stream standard for temperature measured at lowest flows (cfs).



# Sandies Creek near Westhoff (BBEST)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overbank Flows** | Qp: 14,300 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 86,700<br>Duration Bound is 39 | | | | | | | | | | | |
| | Qp: 6,240 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 38,000<br>Duration Bound is 32 | | | | | | | | | | | |
| | Qp: 4,020 cfs with Average Frequency 1 per year<br>Regressed Volume is 24,500<br>Duration Bound is 29 | | | | | | | | | | | |
| **High Flow Pulses** | Qp: 770 cfs with Average Frequency 1 per season<br>Regressed Volume is 4,840<br>Duration Bound is 21 | | | Qp: 1,670 cfs with Average Frequency 1 per season<br>Regressed Volume is 10,100<br>Duration Bound is 24 | | | Qp: 250 cfs with Average Frequency 1 per season<br>Regressed Volume is 1,430<br>Duration Bound is 16 | | | Qp: 570 cfs with Average Frequency 1 per season<br>Regressed Volume is 3,650<br>Duration Bound is 18 | | |
| | Qp: 300 cfs with Average Frequency 2 per season<br>Regressed Volume is 1,880<br>Duration Bound is 16 | | | Qp: 440 cfs with Average Frequency 2 per season<br>Regressed Volume is 2,710<br>Duration Bound is 18 | | | Qp: 59 cfs with Average Frequency 2 per season<br>Regressed Volume is 330<br>Duration Bound is 11 | | | Qp: 150 cfs with Average Frequency 2 per season<br>Regressed Volume is 960<br>Duration Bound is 14 | | |
| **Base Flows (cfs)** | 12 | | | 9.0 | | | 3.8 | | | 9.4 | | |
| | 9.9 | | | 6.0 | | | 2.7 | | | 5.9 | | |
| | 6.3 | | | 3.1 | | | 1.8 | | | 3.2 | | |
| **Subsistence Flows (cfs)** | 1.0 | | | 1.0 | | | 1.0 | | | 1.0 | | |
| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| | **Winter** | | | **Spring** | | | **Summer** | | | **Fall** | | |

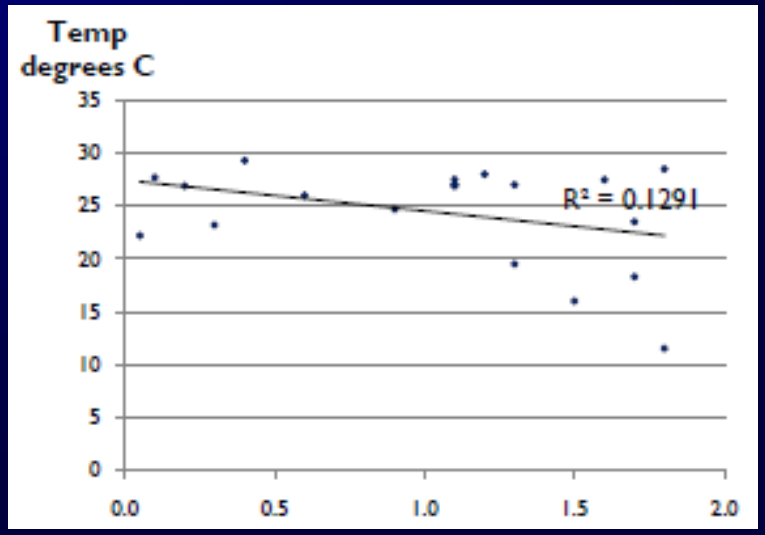
# Sandies Creek near Westhoff (BBEST)



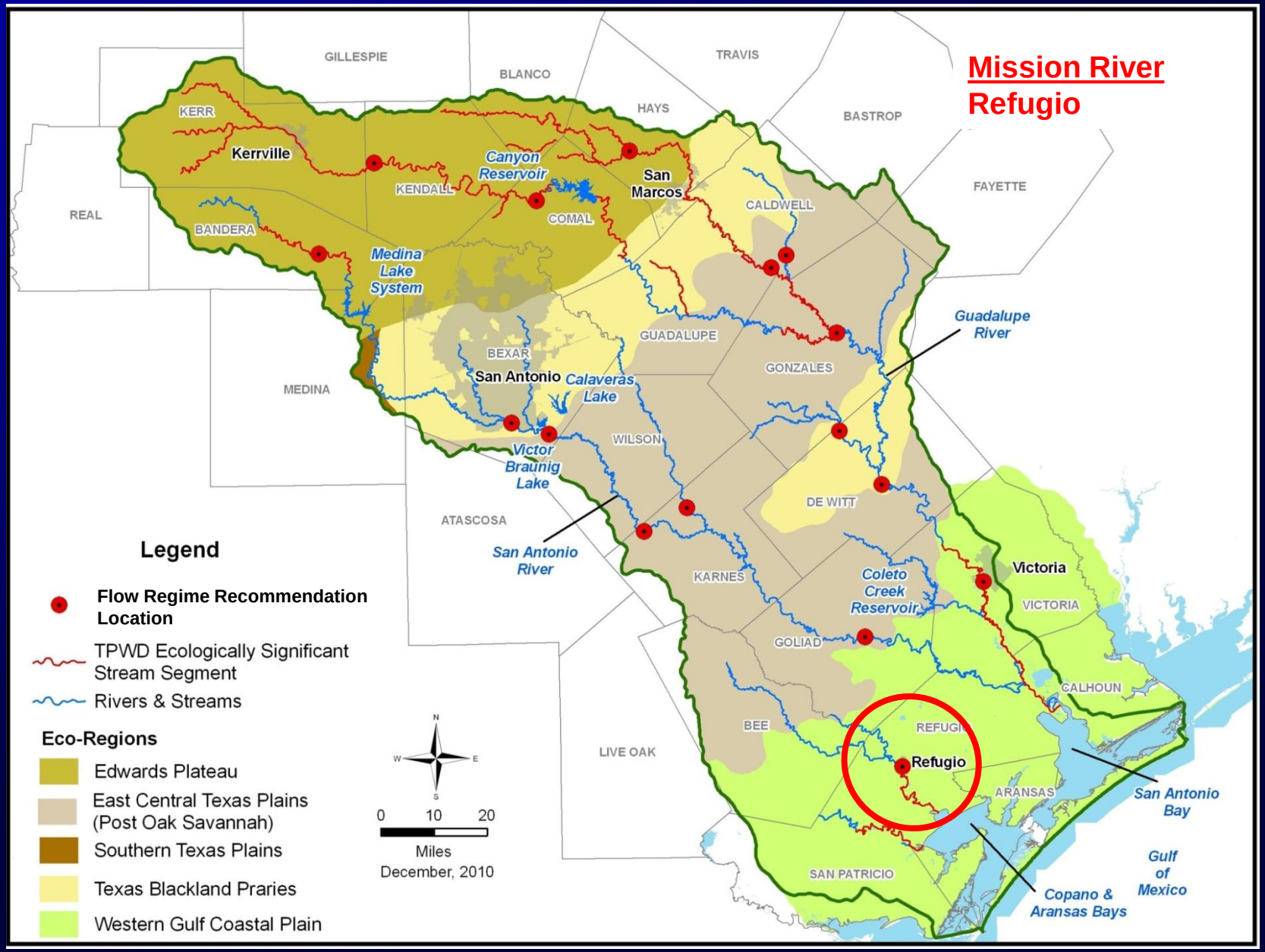

- Many violations of 5 mg/l TCEQ stream standard for dissolved oxygen measured at lowest flows (cfs).

- TPWD has High concern with BBEST subsistence flows (Minimal to Limited Habitat). Comparative Cross-section Method (CCM) flow-habitat relationships only.

- No violations of 93 degF TCEQ stream standard for temperature measured at lowest flows (cfs).



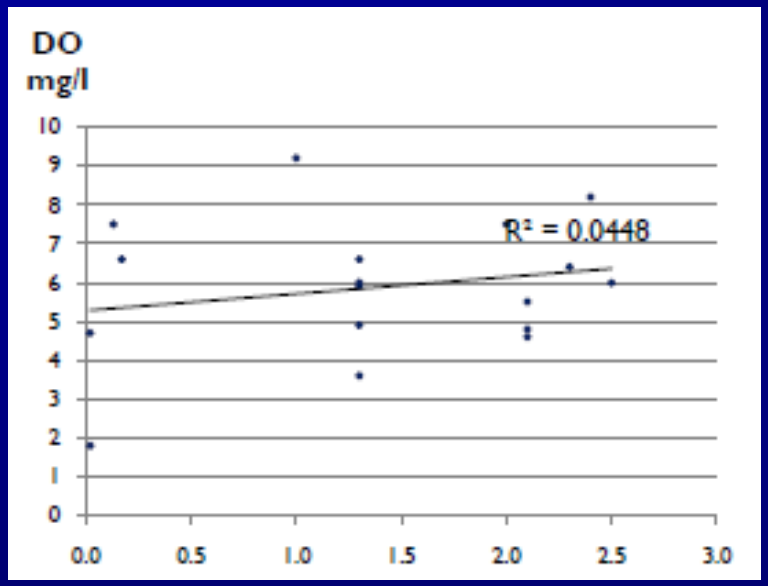
# Group 6:
# Mission River Basin Location



# Mission River at Refugio (BBEST)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Overbank Flows** | Qp: 11,500 cfs with Average Frequency 1 per 5 years<br>Regressed Volume is 66,200<br>Duration Bound is 44 | | | | | | | | | | | |
| | Qp: 6,830 cfs with Average Frequency 1 per 2 years<br>Regressed Volume is 38,400<br>Duration Bound is 36 | | | | | | | | | | | |
| | Qp: 4,160 cfs with Average Frequency 1 per year<br>Regressed Volume is 22,800<br>Duration Bound is 30 | | | | | | | | | | | |
| **High Flow Pulses** | Qp: 450 cfs with Average Frequency 1 per season<br>Regressed Volume is 2,340<br>Duration Bound is 15 | | | Qp: 1,560 cfs with Average Frequency 1 per season<br>Regressed Volume is 7,910<br>Duration Bound is 18 | | | Qp: 420 cfs with Average Frequency 1 per season<br>Regressed Volume is 2,010<br>Duration Bound is 12 | | | Qp: 410 cfs with Average Frequency 1 per season<br>Regressed Volume is 2,090<br>Duration Bound is 14 | | |
| | Qp: 60 cfs with Average Frequency 2 per season<br>Regressed Volume is 310<br>Duration Bound is 8 | | | Qp: 320 cfs with Average Frequency 2 per season<br>Regressed Volume is 1,440<br>Duration Bound is 10 | | | Qp: 57 cfs with Average Frequency 2 per season<br>Regressed Volume is 240<br>Duration Bound is 6 | | | Qp: 45 cfs with Average Frequency 2 per season<br>Regressed Volume is 200<br>Duration Bound is 6 | | |
| **Base Flows (cfs)** | 15 | | | 14 | | | 12 | | | 15 | | |
| | 8.6 | | | 8.3 | | | 7.0 | | | 7.8 | | |
| | 4.7 | | | 4.5 | | | 3.8 | | | 4.5 | | |
| **Subsistence Flows (cfs)** | 1.0 | | | 1.3 | | | 1.0 | | | 1.3 | | |
| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| | **Winter** | | | **Spring** | | | **Summer** | | | **Fall** | | |

# Mission River at Refugio (BBEST)




- Several violations of 5 mg/l TCEQ stream standard for dissolved oxygen measured at lowest flows (cfs).

- TPWD has High concern with BBEST subsistence flows (Minimal Habitat). Comparative Cross-section Method (CCM) flow-habitat relationships only.

- No violations of 95 degF TCEQ stream standard for temperature measured at lowest flows (cfs).